## SUBJECT INDEX

Accidents; in various utility fields, incidence ratio, 459 Accounting; customer; card ledger and, 33 ledger vs. stub and register sheet plans, 1677 machine and, 393 service applications and; 389
bank draft contracts and,
1138 deposits and; 392, 710, 715 percentage of bad debts and, 713 guarantors and, 713, 715, 717 service discontinuance and, 400 trend, as indicated by questionnaire, 1677 punch card system; 1704 history, 1704 payrolls and, 1707 see Billing Acidity, neutralization; lime and, 751 soda ash and, 749 see Hydrogen-ion concentration Administration; 1687 commission and, 1138, 1199
Advertising; see Publicity
Aeration; gas removal by, 515
jet-nozzles in heated and ventilated building, 1904 see Carbon dioxide removal; Hy-drogen sulfide removal; Iron removal; Manganese removal; Methane; Mixing; Odor Air compressor; lubrication, 733 Air conditioning; cross connections and, 69, 245 extent employed, 1189 water consumption and, 318, 1181 Air lift; see Well Albany, N. Y.; alum coagulation, pH adjustment and, 1904 manganese, experiences and removal, 1903 Synura, taste and, carbon and, 1865 Albion, Ind.; elevated tank, savings and, 779 Alexandria, Ind.; metering, results,

Algae; see Microscopic organisms

tion and, 2002

Alkalinity; alum coagulation, reduc-

determination, standard method, accuracy and, 1504 equivalents of alum, copperas and ferric chloride, 1538 see Calcium carbonate; Corrosiveness; Hydrogen-ion concentra-Allentown, Pa.; filters, algae and organic matter, chlorinated wash water and, 1599 swimming pool, chlorine-ammonia treatment, 1625 Alum; black (activated); application to reservoir, 1866 dosage, 1018, 1019 dissolving; agitation and, paddle size, position and speed and, 85 temperature and, 85 tests, 80 feed; dry; 1558 dissolving tank tests, 90 solution, 74 manufacture at water works, 1946 see Chemical feed; Coagulation; Iron removal; Manganese removal; Softening Amebiasis; see Dysentery; American Enka Corporation; filter sand cleaning, 625, 1018 water purification, spore-formers and organic matter and, 623 American Society of Civil Engineers; contracts, form of agreement and, convention hotel plumbing, certification, 216 American Water Works Association; convention; of 1936, 1798 city, water quality requirement, 253, 254 hotel, plumbing certification; 216, 243 procedure, 244, 251 Diven Memorial Medal award, 1810 educational situation in water works engineering and, 925 Fuller Memorial Memberships, 1798 Goodell Prize award, 1810 Henshaw Cup award, 1808 Hill Cup award, 1808 officers, directory, 1631

pollution; federal control, resolution re, 806

legislative committees on, appearances before, 1072 secretary's report-1935; financial

statement, 542 membership statement, 544

what's ahead for, 1165

see Committee reports; Society affairs; and the various sections American Water Works Association, committees; chemical hazards in water works plants-ammonia, re-

port, 1772 convention hotel sanitation, report,

251

directory of, 1631

electrolysis and electrical interference, formation of American Committee on Grounding, 1735

general policy, report, 1422 national water policy, report, 1068 pipe line friction coefficients, 1303

Ammonia; containers; gas withdrawal rates, maximum, 1774

ton, 1621 copper and, 1774

first aid treatment and, 1781

gas masks and, 1779 handling and storing; 1778 ventilation and, 1779

hazards and, committee report, 1772

physiological response to various concentrations, 1781

piping for, 1779 properties, 1773 solubility, 1774

see Chlorination; Chlorination, taste and odor; Taste and odor Ammonium sulfate, feeding of; im-

proving by carbon addition, 1019 in solution, 540

Anabaena; copper sulfate and; depth and, 167

dosage and, 166, 177, 454 vertical distribution, 450

Anaconda Copper Mining Co., Montana; forest destruction case, 1086 Anemia; copper and, 1041

Ankistrodesmus; in reservoir, 177 Anna Hospital, Ill.; manganese re-

moval, 1489 Aphanizomenon, copper sulfate and;

depth and, 167 dosage and, 166, 168, 177 Appleton, Wis.; coagulation data,

1944 Aqueduct, concrete; cement, sulfateresistant, and, 1607

manganese deposition in, 1901 Argyrosis; see Silver

Arkansas; rate case regulations, 1701 Asterionella; copper sulfate, dosage and, 168, 448, 456

vertical distribution, 450

Atlanta, Ga.; chromium plate, cleaning, 1625 copper sulfate treatment, 1018

filter washing, gas vent and, 1017 Atlantic City, N. J.; connections to pipes and valve insertion under pressure, 1618

water supply, emergency connection of private systems and, 1893

Tex.; main construction, Austin, specifications, 358

Bacteria; distribution system, secondary growths in, 1047 see Sterilization

Bacteria, colon group, differenti-ation; E. M. B. agar containing crystal violet, 1963

ferrocyanide-citrate agar, 1964 Bacteria, iron; see Crenothrix; Main Bacteria, manganese; see Manganese Bacteria, spore-forming; see Bacterium coli test; Cellus substle

Bacterium coli; concentration limits for; chlorination, 1993

various treatments, 768

distribution system, secondary growths in, significance, 1048, 1049

-like organisms from leather, jute, fiber, etc., significance, 1049 silver and, 499, 1985

see Bacteria, colon group; Sterilization

Bacterium coli test; confirmation; brillant green bile, spore-formers and, 419

standard method; and brilliant green bile, comparison, 414, 786, 791

errors and, 412, 418

transfer during period of logarithmic increase, 1964

plate count; brilliant green bile agar, 1965

concentration and; on bacterial filter, 1965

by centrifuging with kaolin or infusorial earth; 1966 comparison with standard method, 1971

on nitrocellulose, 1965 E. M. B. agar; 1965

containing crystal violet, 1966 Endo agar, modified, 1965 ferrocyanide-citrate agar, 1964 vs. liquid medium, 1971 presumptive; brilliant green bile, 611, 786 crystal violet broth, 611 Dominick-Lauter broth, 611, 786 formate ricinoleate broth, 611 fuchsin broth, 611 lactose broth; brilliant green bile and, parallel planting, 792 buffered, 611 media, various, comparison with, 611, 786 MacConkey's bile broth, 611 media, evaluating; 613 criterion, maximum recovery as, 785 pure cultures and, 618 spore-formers, various media and, 615 trypaflavine broth, 611 see Bacteria, colon group Bacterium tertium; see Clostridium Bacterium welchii; see Clostridium welchii Baltimore, Md.; air conditioning, water consumption and, 1193 coagulation data, 1946 copper sulfate treatment, 1859 corrosiveness, lime and; 797 hardness, increase, and economic significance, 800 pump, centrifugal, efficiency, 868 pumping stations; automatic; 880 Pikesville, 113 operation, 878 water supply, manganese and, 1901 Barnum, Minn.; concrete tank, 49 Base exchange; see Iron removal; Manganese removal; Softening Bass; copper sulfate and, 624 Bauxite, Ark.; water supplies, fluor-ine and, 1064 Bearing; ball and roller, lubrication, 731, 736 reservoir type ring-oiled, lubrication, 730 Beautification; see Water works Belvidere, Ill.; Diesel drive, costs, compared with steam, 125 Billing; 1008 collection; 399, 1009 final accounts and, 716

Indiana Section committee re-

port, 709

delinquent accounts; collection; agencies and, 714, 717 attorney system, 1669 extent, 1674 lien and, 1138 practice, 35, 397, 398, 714, 716 service discontinuance and; 716, 718, 1009, 1675 deposit balance and, 716 fee and, 36 notice, New York law and, 36 small towns and, 53 delivery; 397 number per man per day, 398 frequency, 30, 1009, 1672, 1690 machine; 33, 393 operators; output, 393 payment; penalizing errors, 393 wage incentive plan, 393 post cards and, 33 punch card system; 1691, 1706 cost, compared with manual and machine, 1694 staggered, 1690, 1694 see Accounting Billings, Mont.; new filters, construction, 44 plant improvements, 43 wash water tank, construction, 45 Birm; see Iron removal; Manganese removal Bleaching powder; see Coagulation Boiler; corrosion; carbon dioxide and, 918 embrittlement, caustic; silica and, 920 sodium sulfate and, 919 stress and, 920 H-ion concentration and; 918 sodium carbonate and hydroxide and, 919 oxygen and; 918 sodium sulfite and tannin and, 919 pitting and, 919 stress and, 918 theory, 918 efficiency, 876 feed water, hardness, operating cost increase and, 1112 aming and priming; calc carbonate and, 529, 532, 535 foaming calcium flint, ground, and, 531 hydroxyl-ion concentration and, 530 magnesium hydroxide and, 532 prevention; blow-down and, 920 castor oil and, 920 scale, finely divided, and; 529

oil and, 531 solids and; dissolved, 529 suspended; 528

pressure and, 531, 534 stabilizing influence, loss on boiling, 530

furnace, operation, carbon dioxide meter and, 995 water, sodium carbonate in, de-

composition, 919 see Railroad

Boiling; prevention of bumping by solid matter, theory, 535 Boonton, N. J.; early chlorination,

685 Boron; determination, 1449

plants, effect on various, 1451 removal, 1452 significance; domestic supply and,

irrigation water and, 1450

Boulder City, Nevada, water; flourine, teeth and, 637 raw, quality, Boulder Dam and, 637 softening; and purification, 627

soap saving, estimated, 639 Boulder Dam; see United States Bureau of Reclamation

Brainerd, Minn.; manganese removal, 1495

Brass; yellow and red, composition,

Bremerton, Wash.; cast iron main, laying inside old wood main, 104 leakage tests, 103 main replacements, financing, 101

metering, 105

taste, creosoted wood pipe, ammonia and, 103

water supply and history, 97 Brewing; silver sterilization and, 496 Bridgeton, N. J.; water supply, emergency connection of private system, 1894

Brilliant green bile; see Bacterium coli test

Brine; corrosiveness, 1511

British Columbia; watershed regulations, 1077

Budapest, Hungary; supply mains, flushing, 257

Budget; see Financing Buffalo, N. Y.; high-pressure mains, TERA project, 337

intake, radio phone and, 1623 reservoir, abandoned, coversion to stadium, 1623

Buhl, Idaho; slow sand filtration, algae and, 107 Burette stand; illuminated, 1019

Calcium carbonate; deposition as protective coating; 797, 1500 lime and, 1501

saturation index and: 1502 temperature and, 1512

-iron oxide protective coating, 799 solubility; salinity and, 1511 temperature and, 1512

California; public relations problem. unemployment compensation, 1728

water resources, 1270, 1285 California Water Service Co.; hypochlorinator, 1626

pumping plants, automatic con-trol, 1170

well, salt water and, chloride recorder and, 1627 Canadian Section; 1936 meeting, 657

Canal, concrete-lined; construction. 1614

curing, coal tar coating and, 1614 Carbon, activated; extent employed. 1863

filters, corrosion in, bitumastic enamel lining and, 2001

filtration, oxygen consumed reduction and, 2003

powdered; application, method, 1020 dosage, 1018

use in water purification, history, 1020

Alum; Ammonium sulfate; Chlorination, taste and odor; Coagulation; Coagulation basin; Color removal; Dechlorination; Filtration, pressure; Filtration, rapid sand; Iron sulfate; Odor; Softening; Taste and odor

Carbon dioxide; coagulation; alum and, 1538, 2002

ferric chloride and, 1538 removal; aeration and, 749 lime and: 797

dosage required, 1538, 1583 limestone contact bed and, 1514 soda ash, dosage required, 1538 solubility in water, 514

see Boiler corrosion; Corrosiveness Carbonate; see Alkalinity; Calcium

carbonate Carbonation; equipment, maintenance, 1574 natural gas and, 751

see Softening Cast iron; see Iron, cast Catadyn; see Silver Catalysis; theory, 1497 Cellus substle; chlorination, ammonia and, 626 gelatinous accumulations in filters and, removal, 625

88

99

n,

Cement; see Aqueduct; Concrete; Dam; Pipe, cement-lined Central States Section; 1936 meeting, 1793

Champaign and Urbana, Ill.; services, electric thawing, 859

Chemical; conveyor, blower type,

Chemical feed; 1533, 1879

dry; automatic, 17 equipment, selection and pur-chase, 1534

equipment, maintenance, 1573 solution; 2001

automatic, 16

orifice, rubber stopper in union and, 1624

to pump suction, automatic, 1628 rate controller, 1626 tank, float valve and, 1017

see Alum; Carbon; Iron chloride; Lime; Permanganate

Chesapeake and Potomac Telephone Co., Baltimore; valuation case, 1697

Chetopa, Kans.; water supply, mottled tooth enamel, damage suits and, 648

Chicago, Ill.; amebiasis outbreaks, 71, 214, 243

dual water systems, city supply through receiving reservoir and,

filters, experimental, rate controller and, 1626

frost difficulties, 849 metering, opposition, overcoming, 1712

"Siamese Twin" fire boat hydrants, hazard and, 72 water treatment, opposition to, 907

Chironomus; chlorine and, 1473 copper sulfate and, 1473

life habits, 1473 Chloramine; see Ammonia; Chlorination: Chlorination, taste and odor; Chlorine, free determination; Taste and odor

Chloride determination; recorder, 1627

Chlorinated copperas; see Coagula-tion; Color removal; Softening

Chlorination; ammonia and; 908, 1217, 1349 addition after chlorine, 1018

Corophium and, 1478

Crenothrix and, 1230 dosage, ratio, 63, 540, 608, 623,

1018, 1862 extent employed, 1861 in impounding reservoir, 623 nitrite formation and, 1093 residual and, 1981, 1982 sterilization rate, 608

apparatus; automatic, 18, 1742 containers, ton, 1558, 1593, 1880 duriron ejector and, 1600 hypochlorinator, 1626 maintenance, 1573

pipeline injection manifold, 1743 B. coli limit for raw water, 768,

1993 Chironomus and, 1473 Cl. welchii and, 1048 dosage, 1219, 1569, 1751 double, 721

extent employed, 1861 history, 685 leptospirae and, 1049

pre-; 634, 721, 1018, 1020, 1946 ammonia and, 63, 540, 608, 624 B. coli limit for raw water and, 768

benefits, 1593

dosage, 1593 residual; contact period before testing, 1090 control, automatic, 1742

practice, 540, 1751 see Ammonia; Ammonium sulfate; Coagulation; Coagulation basin; Color removal; Filtration, rapid sand; Hydrogen sulfide removal; Iron removal; Microscopic organisms; Odor; Swimming pool; Taste and odor

Chlorination, taste and odor; am-monia and, 607

chlorinous; 754, 1998 ammonia and, 1861

carbon filtration and; 1999 bed depth, 2001

wash rate and expansion, 2002 dosage and, 1593

superchlorination and carbon filtration, 2001

creosoted wood pipe, ammonia and, 103

gas and coke works waste and, 755 iodoform, prechlorination and, 1907 microorganisms and, ammonia and, 447

organic coating on filter sand and algae on walls, carbon and, 1600

phenol and, ammonia and, dosage ratio, 1862 superchlorination and, 508 see Odor; Taste and odor Chlorine, free, determination; starch iodide test; 1095 iron and manganese and, 1095 o-tolidin and; H-ion concentration and alkalinity and, 1091 iron and; 1093 interference, avoiding, 1094 manganese and; 1093, 1902 interference, avoiding, 1094 nitrite and; 1093 hydrogen peroxide modification and unreliability, 1093 standards, permanence, 1092 sunlight and, 1092 temperature and, 1091 time and: 1091 ammonia and, 1091 turbidity and color, compensating for, 1092 Cholera; forests and, 1053 Chromium plating; cleaning, 1625 Cicero, Ill.; collections, improved, 1009 leakage survey and waste reduction, 1010 Clarifier; maintenance, 1573 see Color removal; Sedimentation basin; Softening tertium; B. coli test Clostridium media, various, and, 615 Clostridium welchii; B. coli test media, various, and, 615 chlorination and, 1048 sanitary significance, 1048 Coagulation; alkali, choice of, 796 alum; alkalinity equivalents, 1538, 2002 black (activated), 1018 carbon and, 1624 carbon dioxide increase and, 1538, 2002 dosage; 1907, 1944, 1946 mixing and, 1526 paper waste pollution and, 1591 floc formation; alum solution; preparation; method and, 74 mixing period and, 88 strength and, 89 study, 1953 H-ion concentration and; 753,

1538, 1944, 1949

adjustment

acid, 1904

intermittent application, 63

with sulfuric

lime and, 1877, 1946 mixing, velocity 1525, 1877, 1904 velocity and period, residual alumina; deposits in galvanized pipes and, 752, 753 pH and, 753 soda ash and, 2000 chlorinated copperas; advantages, 1950 vs. alum, low temperature and. 1596, 1601 application, method, 1598, 1601. 1950 bleaching powder and, 1598 chlorine-copperas ratio, 1947 vs. copperas; 1951 costs and, 1952 dosage; 1947 effective range; 1601 widening, lime and, 1595 pH and, 1950, 1951 reaction, 1598 suspended matter and, 1951 chlorination and, 1593 coagulants, efficiency of various, 1595 control; jar tests and; 795, 1539 mixing and, 1603 solutions for, preparation, 1539, 1621 laboratory, 1537 double, 1947 efficiency, determination, 1625 ferric chloride; alkalinity equivalents, 1538 carbon dioxide increase and, 1538 iron; compounds; 1949, 1953 availability, 1600 efficiency of various, 1600 pH and, 1538 and lime; H-ion concentration and, 796, 1538 lime required, 1538 order of addition, 796 taste, sweetish, and, 1906 in water and; 752, 1567 pH and, 753 mixing and; 1522, 1602, 1947 bibliography, 1532 period; 59, 609, 1527, 1529 temperature and, 1948 and velocity required, mechanical and basins and, velocity, progressively decreasing, 794, 1528, 1602 theory, 1943 turbidity, descending, combination

of coagulants and, 1594

and iron in water and, 752

see Color removal; Iron removal; Manganese removal; Softening; Turbidity

Coagulation basin; construction, skin coat of concrete on excavation floor and, 1878 depth, 1536

design, 1535, 1948

detention period, 60, 609, 1536. 1877, 1944 inlet, perforated baffle wall and, 1944

new, 60

sludge stabilization; carbon and, 1021

prechlorination and, 1593 stratification, baffles and, 1603 velocity through, 1536, 1877 see Sedimentation basin

Coal; see Filtration, coal; Iron re-moval; Manganese removal Coelosphaerium; sulfate. copper

dosage and, 166 Color; swamps, draining and, 1857 Color removal; alum and; 1944

black (activated); 1018, 1019 application to reservoir, 1866 salt water and, 1622 chlorination and, 2002

pH adjustment and, 1871 carbon filtration and, 1999, 2003 chlorinated copperas and, sodium aluminate and, 1600 chlorination and, 2002

copper sulfate and carbon addition

to reservoir and, 1866 ferric chloride and; 1868 vs. alum, 1871

clarifier and, 1869 H-ion concentration adjustment and, 1871

mixing period and, 1870 sludge recirculation and; 1868 peptization and; 1871

chlorination and, 1872 lime and filtration and, 1019 Colorado; water; resources, 1270 supplies, fluorine and, 1464 Colorado River; water quality,

Boulder Dam and, 637 Columbus, Kans.; mottled tooth

enamel, 648 Columbus, Ohio; burette stand, illuminated, 1019

odor-free water, preparation, 1623 Committee reports; cast iron pipe specifications (sectional committee), 651

chemical hazards in water works plants-ammonia, 1772

collection procedure (Indiana Section), 709

convention hotel sanitation, 251 electrolysis and electrical inter-ference, formation of American Committee on Grounding, 1735

general policy, 1422

national water policy, 1068 pipe line coefficients (New England Water Works Association), 1293

Complaints; handling, 1011, 1720 see Distribution system Concrete; shrinkage, ultimate, 46

temperature and expansion and, 47 vibrators and, 44 walls, paint for, 1624

see Aqueduct; Canal; Dam; Filtra-tion, rapid sand; Pipe, concrete; Tank; etc.

Conductivity; recorder, 1627 Connecticut; interstate agreement re pollution of coastal waters, 766

Consumption; air conditioning and, 318, 1181 Denver, Colo., 1693, 1875 high, Missoula, Mont., 266 Los Angeles, Cal., 1210

metering and, 772 municipal and agricultural, simi-

larity, 1234 Simcoe, Ont., 1927 temperature, low, and, 1063 Tokyo, Japan, 720, 721 Two Rivers, Wis., 610

Contract; form of, 360 Copper; ammonia and, 1774 anemia and, 1041 electrical resistance, 857 water treatment, history, 492

see Services Copper sulfate; solubility, 1472 Copper sulfate treatment; 447 application; aeroplane and, 172 blower and, 165, 178, 1859

continuous to water entering reservoir; bag in stream and, 1860

dry feed and, 1860 to filter plant influent, 1020 ice on reservoir, through holes in, 1861

motor boat and, 455 perforated boxes and motor boat,

1859 sacks dragged by boat; 163, 1471 boat lanes at right angles, 169 crystal size and, 164 inaccuracies and, 165, 1858 time and labor required, 171

sacks floated on inner tubes, 1018, scatterer and; 165, 172, 179, 1471, 1472, 1858 copper sulfate specifications and, 178 depth, crystal size and, 165, 174 magnesium carbonate and activated clay addition and, 178 time and labor required, 176 in solution, by spraying, 164, 1471, 1859 to well supply under pressure, 1867 basic carbonates and hydroxide formation, rate of, 170 bass and, 624 copper chloride, substitution of, 172 copper in solution, period after treatment, 1470 dosage; 163, 624, 1472, 1860, 1865 temperature, organic matter, alkalinity and carbon dioxide, corrections for, 166, 168 trout and, 456 uniformity, checking; diethyldi-thiocarbamate and, 174 sodium sulfide and, 172 vertical distribution, observations on, 1470 see Anabaena; Chironomus; Crenothrix; Fragilaria; Melosira; etc. Corophium; chlorination and, am-monia and, 1478 in reservoirs, 1478 Corrosion; see Boiler; Meter; Pipe, steel; Railroad; Services; etc. Corrosiveness; calcium carbonate saturation index and; 1500 temperature and, 1512 treatments, various, and, 1514 of typical supplies, 1517 carbon dioxide and, 797 correction; 796 determining effectiveness, tests with rusty nails, 1623 determination; calcium carbonate saturation index and, 1502 marble test and, 1514 H-ion concentration and; 797 adjustment; alkalies and, 1300 lime and, 756

lime and; 797, 1018 control; H-ion concentration re-

marble test and, 799

corder and, 799

cost; 800

compared with soda ash and caustic soda, 802 hardness increase, and economic significance, 800 limestone contact bed and, 1514 oxygen dissolved and, 797 red water; cold water conditions and, 1979 pH adjustment and; 1045 marble test and, 1981 temperature and, 1511 water quality deterioration and, 1046 zeolite softening and, 1514 see Brine; Calcium carbonate Covington, Va.; chemical solution tanks, float valves and, 1017 Crenothrix; chloramine and, 1230, copper sulfate and, well supply and, 1867 in distribution system, 1047 tunnel infiltration and, 1230 in water supply, 258 Cross connections; 1045, 1048 air conditioning and, 69, 245 amebiasis and, 71, 214 check valves; double, all-bronze, F. M. type, 1889 inspection, frequency, 1891 drinking fountains and, 248, 936 dual water systems and; 70 city supply through tank and, 71, 1891 piping of distinctive color and, 71, 249 swing joint and, 1892 dysentery and, 215, 1887 elimination program, 234 filter in private building, dysentery outbreak and, 237 fire pump priming connection and, 238 hazards and, 67 horse watering troughs and, 239 hospitals and; 242, 936 survey, 227 hot water systems and, 239 hotels and; conventions and; A. S. C. E., certification and, 216 A. W. W. A., certification and; 216, 243 committee report, 251 procedure, 244 survey, 227 hydrants for fire boats, "Siamese Twin" and, 72 milk plants and, 228 plumbing and; 235, 242 education of public re, 697

fixture siphonage and, 215, 247, 935 department's responsihealth bility and, 696, 935 prevalence, 241 service check valves and, 236 survey; 217 cost, 218 types, 221, 237 refrigeration plants and, 236, 936 regulations, state, 1885 survey, 234 swimming pools and, 225, 228 typhoid and, 215, 231, 1887, 1888 see Plumbing; Water closets Crystal violet; see Bacterium coli test Culpepper, Va.; Diesel engine drive, costs, 126

Dallas, Tex.; coagulation, chlorinated copperas and, 1947, 1950 Dam; concrete; cement; low-heat, 1606

puzzolan, 1607
construction, developments, 1610
height, increasing, 1608
design and construction, revision
of federal manuals, 1272
earth; construction, soil compaction; control; 134
percolation-consolidation

cylinder and, 140
Delmag Frog and, 1609
moisture and; 134
determining, plasticity
needle and, 137

cutoff walls and, 131 design, 127 developments, 1609

face protection; 132 watertightness and, 133

largest in world, 1609 foundations, developments re, 1605 rock-fill; developments, 1609 earthquake and, 1610

stress analysis, 1607 Danvers, Mass.; main breaks, emptying with air pressure and, 1017

Daphnia; silver and, 502 Dechlorination; carbon filtration

and, 258, 2003

Deer Lodge Namonal Forest, Montana; tree damage by smelter, study of effect on streams, 1086

Delphi, Ind.; meters, freezing, pre-

vention, 1136 Denver, Colo.; billing; 1690, 1694 punch card, 1691, 1694 consumption, 1693, 1875 intration; plants, 1873 West Side plant, details, 1873
Fraser River diversion, soap saving
and, 1874
water department, reorganization.

1686

Depreciation; rates; for various structures and equipment, 348 Wisconsin statistics, 2.6

reserve for, 384 see Valuation

Detroit, Mich.; raw water tunnels, surge tests, 295

turbidity determination, illumination and, 1625

Diabetes; lime-soda softened water and, 917

Diatoms; copper sulfate, depth and, 167

Diptera chironomus; see Chironomus Disease; water-borne, contamination enroute to consumer and, 67

see Anemia; Bone; Cholera; Diabetes; Dysentery; Goiter; Health; Jaundice; Kidney; Teeth; Typhoid

Dissociation, electrolytic; theory, activity concept, 1506

Distribution system; bacterial increase in; 1047

significance, 1048, 1049 construction, field reports and, 1760 dead end elimination, pressure improvement and 782

improvement and, 782 developments and, 1617 extensions, planning, 602 fire protection and; 1106 improving for, 702, 705

flushing, complaint reduction and,

maintenance, 402 planning and, 1100 records; 405, 738 and maps, 1756

small municipalities and, 1918 trunk line survey; pitometer, 408 value, 1099

valves; 180

between districts, cracking for circulation, avoiding, 182 control, remote, 211 inspection, frequency, 183

operation by inexperienced men, damage and, 1011

practice, 402

records; of inspection and operation, 1762

of location, 1756

water quality deterioration in, 1044 see Fire hydrant; Fire protection; Leakage; Main; Pipe; Pressure; Valve; etc.
Dominick-Lauter medium; see Bacterium coli test
Drinking fountains; cross connections and, 248, 936
Duluth, Minn.; water supply and sewage disposal situation, 905
Dysentery; amebic, cross connections and, 71, 214, 243
cross connections and; 215, 1887
filter, private, and, 237
purification, improper control and, 694

Earth; see Dam; Soil
Earthquake; water works, damage
and, 908
wells and, 910
see Dam
East Bay Municipal Utility District;
filters, wooden baffles and, 1559
Orinda filtration plant, 1551
water; quality, 1568

supply, 1551 East Lansing, Mich.; zeolite softening and iron removal, 1486 El Paso, Tex.; pipe joints, cement, 1769 services, 598

soil conditions, 596
Electric circuits, grounding to water pipes; alternating current and, 461
American Research Committee on, formation of, 1735
amperage, fatal, 464
conduits and, 463

direct current and, 460 hazards and, 458 household appliances and, 463 lightning arrestors and, 467 neon signs and, 467 neutral wire and; 461 meter jumper and, 461 radio and, 464 taste and odor and, 468

telegraph system and, 466 telephone system and, 465 Electric motor; lubrication, 1572 maintenance, 1572

speed variation, methods, 869 see Bearing; Pump, centrifugal; Pumping station

Electric power; cost, 118, 126 Electrolysis; 466 metals, various, and, 460

steel pipe and, 1349 Elgin, Ill.; hydrants, thawing, 1136 meter practice, 886 Endameba histolytica; see Dysentery Endo medium; modified, 1965
Engine, Diesel; depreciation, 121, 123
lubrication, 733
operation, sequence, 119
thermal efficiency, compared with
gasoline engine, 120
see Pump, centrifugal; Pumping
station

Engine, gasoline; lubrication, 733 thermal efficiency, compared with Diesel engine, 120

Eosine methylene blue agar; see Bacteria, colon group; Bacterium coli test Erie, Pa.; pumping station, remote

control, 592 Eudorina; copper sulfate and, dos-

age, 454
Eugene, Ore.; coagulation data, 1944
Evaporation; determination, 27

Iowa and, 196 Rochester, N. Y., reservoir and, 27

Fayetteville, Ark.; Diesel engine drive, 124 Ferric and ferrous; see Iron Ferrocyanide-citrate agar; see Bacteria, colon group: Bacterium coli

rerrocyanide-citrate agar; see Bacteria, colon group; Bacterium coli test Filter gallery; see Infiltration gallery

Filtration; capital cost, 907 magnetite and, 1621 see Carbon, activated

Filtration, coal; plant, 1873
see Iron removal; Manganese removal

Filtration, double; see Filtration, slow sand Filtration, pressure; alum, black (activated), and, 1018

(activated), and, 1018 carbon addition and, passage through filter and, 1018

gravel, depth; 1588 and size, 2000 head loss, final, and, 2002 plant; 1933 new, 1582, 1588, 2000

rate, 2000 sand depth and size, 1588, 2000 Filtration, rapid sand; air binding, 1549 coagulation, in absence of, 1552, 1944

control equipment, 1546 effluent; floc detectors and, 1879 turbidity and, 541, 1567 gravel; alumina deposit and, 752

cemented, 1545 depth, 61, 009, 628, 1561, 1878 size, 61, 1561, 1878 wooden tub, 1873

head loss; final, 64, 1568 recorders, maintenance, 1575 influent, discharge below sand surface, 1868, 1870 pipe gallery; 1556, 1879 copper tubing and, 1557 improvements, 1543 plant; construction; 1563 concrete and, 1881 cost, 63, 1564, 1565, 1883 design, trends, 1541 equipment, maintenance, 1571 new, 60, 608, 1873 operation, cost, 610, 1566 purification effected, 726 rate; 540, 1558, 1562, 1868, 1869, 1870, 1878 controller; 11 for experimental filters, 1626 maintenance, 1575 recorders, maintenance, 1575 runs; 64, 540, 933 algae and; 64, 1568 copper sulfate and, 1020 carbon addition and, 1864 cellus substle and, 625 growths in filters and, prechlorination and, 1593 sand; coating; chlorination and, 1872 cleaning, sulfuric acid and, gelatinous, cellus substle, caustic soda and soda bleach and, 625 manganese and; and remedies, 1902 removing, caustic soda and, 1018 re-solution in idle filters, organic, and algae on walls, chlorinated wash water and, 1600 cracking, 752 depth, 61, 609, 628, 1561, 1868, 1869, 1879 mud balls and, 752 size, 61, 1561, 1868, 1869, 1871, 1879 underdrains; perforated pipe; 61, 1558

cement-lined cast iron, 1878

wooden baffles to prevent lateral

units; concrete, construction, 44

flow and gravel disruption,

hydraulics of, 1554 porous plates and, 1545

trends, 1544

h

g

wash; gas vent in manifold and, 1017 gravel disturbance and, 752 rate; 62, 1019, 1554, 1561 controller; 8, 10 automatic, 13 sand expansion and, 64 surface, 1548 water; percentage; 540, 1569 coagulation, mixing and, 1526 recirculation, 1881 storage and discharge into irrigation ditch, 1880 troughs, height above sand, 1558, 1868, 1870 Filtration, slow sand; cleaning, Blaisdell washer, ice and, 840 plant, 1873 prefiltration and, 1542 purification effected, 726 rate, 721 runs; 721 algae and, 107 Financing; budget and; 1690 fundamentals and, 741 main replacements, 101 municipal plants, funds, diversion, return, rate; 385 Wisconsin statistics, 352 revenue; distribution by classes of service, 353 -operating expense ratio, Wisconsin statistics, 342 small town supplies and, 51 turnover, Wisconsin statistics, 345 see Depreciation; Fire protection; Rates; Taxation; Valuation Fire hydrants; freezing, prevention, 839 frozen; 846, 853, 1063 thawing; carbide and, 846 cost, 855 gasoline and, 1136 sulfuric acid and, 1136 maintenance, 190 painting; 642 classification and, 1800 practice, 403 requirements, 1106 'Siamese Twin' fire boat connections, hazards and, 72 see Fire protection Fire insurance rates; water supply and, 986 Fire loss; annual, in United States, 1916-35, 421 Fire protection; charging for; 387

hydrant rental and, 610 revenue from, Wisconsin data, distribution system and; 1106

improving and, 702, 705

flow, underwriters' requirements, 783, 1103

pressure and: 1105 high, system, 24

pumping station requirements; 1107 underwriters and, 984

storage and; 1105, 1108 elevated, 782

ground reservoirs, 701 water supply and; improving, 699 reliability, 1107

Fire protection, private; rates for, 943 services, detector meters and, 601 Fish; see Bass; Goldfish; Mosquito; Trout

Fish Creek, Cal.; forest and stream flow study, 1082

Flood; forest and, 1057, 1084

National Resources Committee, studies, 1267

New York State-1935, 1

Pennsylvania, 1936; typhoid and, 1843

water supplies and, 1835 West Virginia, 1936, water supplies

and, 1846 see Grand River; Kansas City;

Water works Florida; waters, fluorine in, 1042 Florida Section; 10th meeting, 658

Fluorine; in body, fate of, 1462 bone structure, weakening and, 648 content, permissible, 650, 1463 determination; 1064, 1456, 1465

interfering substances, separation by steam distillation,

1461, 1466. removal, 1067 in water; 1042, 1064

bibliography, 1067 origin of, 1066

see Iron determination; Teeth Fluorosis; see Teeth

Flushometer; see Water closet Fly; control, 1477

Forests; cholera and, 1053

municipal, 1059 rain, percentage reaching ground, 1088

soil of, absence of pathogenic bacteria in, 1053

transpiration loss, 1087

water resources and, 1051 see Flood; Runoff; Soil; Spring;

Formate ricinoleate broth; see Bacterium coli test

Fort Caswell, N. C.; ground water pollution investigation, 1954

Fort Dodge, Ia.; filter; control panel, 1546

pipe gallery, 1543 Fort Pierce, Fla.; treatments employed, 1017

water works, welcome sign and. 1613

Fort Wayne, Ind.; softening and coagulation data, 1946 Fountain; see Drinking fountain

Fragilaria; copper sulfate, dosage and, 166, 168 Frankfurt, Germany; corrosiveness,

limestone contact bed and, 1514 Franklin, N. J.; typhoid epidemic, cross connection and, 1888 Frost; see Fire hydrant; Main; Meter;

Pipe, cast iron; Services; Soil Fuchsin; see Bacterium coli test

Furstenwalde-a-Spree, iron removal, 1590

Gallionella; in water supply, 258 Gas; -liquid equilibrium laws, 513 and coke works waste; see Chlorination, taste and odor

Georgia: stream flow and water quality data, need of, 1977 Glendive, Mont.; softening plant,

operating experiences and costs, 932 Gnat, black; control, 1476

Goiter; iodine and; 1041 form of and, 1042 see Iodization

Goldfish; silver and, 503 Goshen, Ind.; elevated tank, savings

and, 780 Grand Rapids, Mich.; softening and coagulation data, 1946

Grand River (Ontario); floods and; 1117

impounding reservoirs, proposed, 1119 water supply and, 1120

Greensboro, N. C.; meter box lock, 1620

Greenwich Water Co.; manganese remov , 1018, 1907

1.; coagulation, alum and Griffin, carbon, 1624

Ground; see Electric circuit; Soil Gunite; see Pipe, steel

Hackensack Water Co.; copper sulfate and carbon treatments, 1020 delinquent accounts, attorney system of collection, 1669 employees' suggestion box, 1020,

1624

er

ol

d

Hagerstown, Md.; drinking water cooler with exposed meter in business office, 1624 Haguenau, Alsace; cholera, freedom

from, 1054 Hamilton, Mont.; well development,

Hamilton, Ont.; filtration plant, 57 Hanover, Germany; iron removal, 1590

Hardness; acceptable degree of, 1112 distribution in United States, 764 health and, 1039 kidney stones and, 1039

losses due to; 471

boilers and, 1112

monetary equivalent, 1222 see Boiler; Railroad; Soap; Soften-

ing Health; hardness and, 1039

iron and, 1041 mineral salts, physiological effects,

silver and, 503

see Disease; Water quality Helena, Mont.; water system, earth-

quakes and, 908 Hetch Hetchy; see San Francisco High Point, N. C.; filter sand clean-

ing, 1018

manganese removal, 1019 Hillburn, N. Y.; black alum treat-

ment in reservoir, 1866 Holland. N. Y.; hydrogen sulfide removal, aeration and chlorination,

Holyoke, Mass.; water supply, rainfall and stream flow and, 202

Hospital, cross connections; 242, 936

survey, 227 Hot Creek (California); water, boron content, 1453

Hotel plumbing; conventions; A. S.

C. E., certification and, 216
A. W. W. A., certification and; 216, 243

committee report, 251 procedure, 244

cross connections; amebiasis and, 214, 243

survey, 227 Houston Lighting and Power Co.; customer accounting, 389 Hydrant; see Fire hydrant

Hydraulic jump; mixing and, 1523

Hydraulics; model studies, increasing use of, 1610

Hydrogen-ion concentration: adjustment; lime and, 1568 soda ash and, 2002

determination; accuracy, 1511 recorder and, 796

softening, zeolite and, 1514 temperature and, 1512

see Acidity; Boiler corrosion; Coagulation; Color removal; Corrosiveness; Pipe, cast iron; etc. Hydrogen sulfide removal; aeration

and chlorination, 1862

Ice manufacture; water sterilization with silver and, 496

Idaho; water; resources, 1270 supplies; data, 106

fluorine, mottled tooth enamel and, 107

Illinois; P. W. A. water projects, 1022 Illinois Section; 1936 meeting, 659,

Indiana; frost troubles, 1935-6, 1062 water works superintendents, frequent changes and, 693

Indiana Section; 1936 meeting, 657 report of committee on collection of accounts, 709

Indianapolis Water Co.; apartment house demand studies, 884 pumping stations; coal consumption, determining, 992 ultimate development studies, 984

tank, elevated, 784 Infiltration gallery; 1923 on lake shore, 1932 problems and, 1913 roots and, 1925

Intake; 1933 communication, radio phone and, 1623

pipe, east iron, 1934

Iodine; content of water supplies, 1230 see Goiter

Iodization; Rochester, N. Y., goiter reduction and, 28

Iowa; evaporation, 196 rainfall, 196

supplies, water impounded. drought and, 194, 202

Iron; content, permissible, 1112 determination, thiocyanate and, fluorides and, 1458

difficulties due to, 1480

health and, 1041 impounding reservoir and, wasting from bottom vs. over spillway, 1862

see Chlorine, free, determination Iron carbonate; see Iron removal Iron cast: electrical resistance, 85

Iron, cast; electrical resistance, 857
see Pipe; Services

Iron chloride; ferric, feed, 1534, 1869 see Coagulation; Color removal; Softening

Iron hydroxide; ferrous, solubility, 1586

Iron removal; aeration and; 1581, 1584 and base exchange, pressure

system, 1925 splash-tray, coke and filtration,

splash-tray, coke and filtration 1902

alum and, 1577 Birm and, 1490, 1493 chlorination and, 1581

coal coated with oxides and, 1490, 1493

ferrous carbonate precipitation with lime in closed system without aeration, 1577, 1903

filtration; coating of oxides and; 1489, 1490

artificial and, 1489 shavings and, tin oxide impregnation and, 1590

iron and lime coagulation and, 1902 lime and; 1577

and alum, 1489, 1579 softening and, 1590

manganese dioxide and, 1492, 1496 organic matter and, chlorine or permanganate and, 1902

pyrolusite and; in aerated beds,

in aerator trays, 1489 in filters, 1490, 1494

soda ash and, 1577 sodium hydroxide and, 1577

zeolite and; 1903 manganese; 1485, 1493

regeneration, permanganate required, 1486

softening and; 1483 over-run method, 1485 Iron sulfate; feeding, improving by

carbon addition, 1019
see Coagulation; Iron removal;
Manganese removal; Softening

Manganese removal; Softening Iron, wrought; electrical resistance, 857

see Pipe, wrought iron; Services Irrigation; stream pollution and, 913 water; boron and, 1450

requirement, municipal consumption and, similarity, 1234 Ithaca, N. Y.; taste and odor, carbon addition and, 1864

Jamaica, N. Y.; Crenothrix, chlorination, ammonia and, 1867

taste, superchlorination and, 1863 Jaundice; spirochaetal, leptospirae in water and, 1049

Kansas; fluorine content, permissible, State Board of Health and, 650

Kansas City; flood protection, National Resources Committee study, 1274

Katadyn; see Silver

Kentucky-Tennessee Section; 11th annual meeting, 806

Kidney stones; water hardness and, 1039

Laboratory; traveling, 1622 see Water analysis

Lachine, Que.; pitometer water waste survey, 1937

Lawn irrigation; rates and, 943 Lead; electrical resistance, 857 see Services

Leadite; see Pipe, cast iron Leakage; detector, new type, 1619 elimination, economy and, 406,

1097 large, without surface indication, 104

survey; cost, 405

meter and hose system, 103 permanent gaging points and, 1941

procedure, 408 results, 405, 409, 1010, 1937 see Main; Waste

Leptospirae; chlorination and, 1049 jaundice and, 1049

Lime treatment; feeding and, 1534, 1558, 1589

sterilization and, 917, 933

see Acidity; Carbon dioxide removal; Coagulation; Color removal; Corrosiveness; Hydrogenion concentration; Iron removal; Manganese removal; Softening; Turbidity

Limestone; see Carbon dioxide removal; Corrosiveness

Lindsburg, Kans.; Diesel engine drive, 124

London, England; Kempton Park filter plant, 1542 Los Angeles, Cal.; bookkeeping and

Los Angeles, Cal.; bookkeeping and billing, tabulating equipment and, 1705 chlorination. residual control. automatic, 1742 consumption, 1210

copper sulfate treatment, scattering and, 163, 1471, 1472, 1858 distribution system records, 1756 earth dams; concrete facing, watertightness and, 133 compaction

soil construction, control, 134

fire hydrants, maintenance, 190 ground water, artificial storage by spreading, 1246

mains, interference of other substructures, 185

pipe; cast iron, fittings, 189 steel; coating; materials, testing, 1372

plant procedure. and 1393

joints, cement, 191 rates, 1210

valves, experiences and practice,

water supply; boron and, 1452 fluoride and, 1459

history, 1205 Mono Basin and, 1210, 1238 Owens River and; 1207, 1234 surplus, use for irrigation;

rates and, 1236

Wilmington color removal plant, extensive modifications and, 1868

Los Angeles County Flood Control District, San Gabriel Dam No. 1; redesign, 1609 compaction, Delmag Frog

and, 1609 Lubrication; of water works equip-

ment, 730 Lynchburg, Va.; new cast iron pipe line, 38 water supply history, 38

MacConkey broth; see Bacterium coli test

Wis.; services, thawing, Madison, 1136

Magnesium; see Softening Magnetite; see Filtration

Mains; on bridges, cork insulation and, 1919

carrying capacity, tuberculation and, 211

depth, 402, 841, 851, 1062 dual, 191, 1919

failures, frost and, 847, 1063 frozen; 852, 1063

thawing; electric, time and cost, 866, 1137

steam, portable boiler and. 854

iron bacteria, removing, air and water flushing, 1623 laying; contract, form of, 360

proposals, form of, 359

specifications and plans, preparation, 356

leakage, permissible, 358

repair, emptying with air pressure and, 1017

sterilization, 359, 402, 1049

substructures, other, interference and, 185

supply, flushing, 257 vacuum in, conditions causing. 215, 239

see Distribution system: Financing; Leakage; Pipe

Manchester, Mass.; concrete tank, seepage and, 48 Manganese: chemistry of, 1897

deposition; in concrete aqueduct, 1901

on filter sand; and remedies, 1902 removing, caustic soda and, 1018

re-solution of, 1902 mine drainage and, 1902

oxidation, chemical and by manganese bacteria, pH and, 1898 reservoir, impounding; source of, in, 1899

wasting from bottom vs. over spillway and, 1862

stains on chlorinator bell jars and,

teeth, staining and, 1041 troubles due to, 1480, 1897

see Chlorine, free, determination

Manganese removal; alum coagula-tion at high pH, 1907 Birm and, 1490, 1493 coal coated with oxides and, 1490,

filtration; coating of oxides and; 1489, 1490

artificial and, 1489 iron and lime coagulation and, 796,

1902, 1906 lime and; alum and, 1489

filtration and, 1019 manganese dioxide and, 1492, 1496 permanganate and alum, 625

pyrolusite; in aerated beds, 1490 in aerator trays, 1489 in filters, 1490, 1494

splash-tray aeration, coke and filtration, 1902 zeolite and; 1903

manganese; 1485, 1493 regeneration, permanganate required, 1486

softening and; 1483 over-run method, 1485 Manhan River; rainfall and runoff,

Manhole; ventilation, 1019, 1624 Marshalltown, Ia.; metering, 1204 water supply, survey of properties not served, 1201

Materials; inventory, 1691 McMinnville, Ore.; water supply, 56 Melosira; copper sulfate and, dosage, 168, 448, 456

vertical distribution, 450 Memphis, Tenn.; iron and manganese removal, 1902

meter and leak tester, 1765 unaccounted for water, 1764

Merrimac River Basin; reforestation, effects of, 1088

Meter; accuracy; minimum flow and, various sizes, 372, 882

small flows and, importance, 772

boxes; 371, 841 lock and, 1620 locking, advisability, 600 castings, painting, 1021

cleaning; 1021 phosphate and acid and, 889, 894 corrosion, 373, 377

dial glass, moisture on, preventing, 775

disc; repair, 774 under-registration, causes, 773 freezing, prevention by packing

curb vaults with straw, 1136 frozen; 837, 839, 842, 853, 1062, 1137 damage and, charging for, 264 responsibility and, 839

thawing; cost, 855 portable gasoline-fired boilers and, 854

gear lubrication, elevated container and, 1021

history, 770 hot water damage, charging for, 239, 264

large vs. battery, 601 life, 375

location, 841 ownership, 265

practice, small towns and, 54 records, 374, 892 repair; 264, 374, 1011

need of, prevention, 369

selection, 370, 595, 601, 888 size and; 371, 372

apartment houses and, 884 minimum and, importance, 882 required, determining, recorder and, 893

86

Mie

Mi

Mi

Mi

M

M

N

testing; at consumer's request. charge for, 32 flow rates and, 212, 374 frequency, 264, 373, 890 machine; 1620

air chamber and, 1021 in situ; 264

Memphis machine and, 1765 Meter reading; 1008 consumption, unusual, checking, 32 frequency, 263, 392, 888 occupants' absence, practice and,

887 practice, 31, 262, 887

routes, alternating, 392, 1008 Metering; Bremerton, Wash., 105 Marshalltown, Ia., 1204

opposition to, overcoming, 1712 Simcoe, Ont., 1927 Waco, Texas, 1198 Suburban Sanitary Washington

District, 841 Western New York Water Co., 30 see Consumption

Methane; removal, aeration and, 1870 Metropolitan Water District of Southern California; Colorado River; aqueduct; canal construction, 1614

pump studies, 1615, 1786 supply, use of suplus for irrigation, 1238

concrete pipe, extensive use, 1613 see Colorado River

Michigan, Lake; currents in, 897 pollution, 898

water supply and sewage treatment, relationship, 896

Microscopic examination; trating; Kofoid method, 452 Sedgwick-Rafter method, sand for, 453

results, expression of, areal vs. volumetric unit, 453

sampling; depth, device for, 452 plankton net, errors and, 451

Microscopic organisms; chlorination and; 1470 ammonia and, 623, 1470

distribution; horizontal and vertical, 449

seasonal, 448 in distribution system, 1046 silver and, 493, 500, 505

see Anabaena; Asterionella; Chlorination, taste and odor; Copper sulfate treatment; Filtration, rapid sand; Filtration, slow sand; Fragilaria; Melosira; etc. Middletown, N. Y.; watershed im-

provements, 339

Milford, Conn.; see New Haven Water

Co. Milk plants; cross connections and,

Milwaukee, Wis.; filter gravel, depth and size, 1878

street substructures, control, 188 valves, butterfly, 1618

water supply and sewage disposal situation, 901

Mine; abandoned, sealing, progress, waste; manganese and, 1902

pollution, 748

Mineral content; physiological effects, 1038

see Water analysis Minnesota; rate regulation, 1699 Mississippi River; water composition at New Orleans, 538

Missoula, Mont.; water supply and consumption, 266

well development, 267 Missouri Valley Section; 1935 meet-

ing, 656 1936 meeting, 1795

Mixing; aeration and; 1944 compressed air and, 1524, 1870 basin, baffled; 539, 1523, 1904

progressively decreasing velocity and, 794

devices; census, 1524 laboratory, 1622 maintenance, 1573

flash, 59, 1526, 1877 flocculator and, 59, 1526, 1593, 1877

hydraulic jump and, 1523 mechanical; 609, 628, 750, 1525,

1527, 1870 basin dimensions, 1525 first use of, 1525 straight line, 1526

pumps and conduits and, 1523 spiral flow, 1524, 1877 spirovortex pump and, 1529

Turbo, 1870

see Coagulation; Color removal; Softening

Monongahela River; hardness variations, 748 pollution, mine waste and, 748 treatment of, experiences, 748

Montana; railroad supply problems,

water resources, 1270

Montana Section; 1936 meeting, 809 Henshaw Cup award, 1808 Morris Dam; see Pasadena, Cal.

Mosquito control; 1474 fish and, varieties, 1476

Motor; see Electric motor Mount Vernon, Ill.; manganese removal, 1489

München-Gladbach, Germany; iron removal, 1590

National Resources Committee; pollution, Special Advisory Committee; recommendations 764, 1266 study, 1264

Water Resources Committee; activities; 759, 1252

discussion of, 1282, 1629 arid and semi-arid West, problems and, 1268

basic information, collection of, 1259

drainage basin studies, 1275 federal and state activities, coordination and, 1261

flood studies, 1267 objectives, 1069 origin and personnel, 1258

program, future, 1275 specific studies, instances of, 1272 water works statistics, collec-

tion of, 1271 Navicula; in reservoir, 177 Nebraska; water resources, 1270 Nevada; water resources, 1270

New England; impounding reservoir requirements, 201 New England Water Works Asso-

ciation; pipe line friction coefficients, committee report, 1293 New Haven Water Co.; reservoir,

copper sulfate and carbon treatment, 1865

New Jersey; coastal waters, pollu-tion, interstate agreement and,

northeastern, history of development of use of water, 973

State Dept. of Health; cross connections, supervision, 1885 water supplies, supervision, 1887 well drilling and drillers, legisla-

tion and, 2008 New Jersey Section; 1936 meetings, 656, 1794

New Martinsville, W. Va.; flood of 1936, water works and, 1853

New Milford, N. J.; see Hackensack Water Co.

New Orleans, La.; purification; and plant extensions, 537

and pumping cost, 541 New Rochelle Water Co.; manholes, ventilation, 1019, 1624

meter repair, 1021 New York, N. Y.; Croton Reservoir,

copper sulfate treatment, 1860 iron removal without aeration in closed system, Flushing plant, 1577

pipe corrosion experiments, 1517 street substructures, control, 188

tunnel, new, 1617 water supply, manganese and, 1901 New York Section; 1935 meeting, 271 1936 meetings, 656, 1794

New York State; carbon, extent employed, 1863

chlorination and chlorine and ammonia, extent employed, 1861 coastal waters, pollution, inter-

state agreement, 766 flood of 1935; damage and, 3

rainfall and streamflow during, 1 unemployment compensation, 1727 water; bills, non-payment, service discontinuance, law and, 36 supplies, iron and manganese

and, 1900

works, construction with federal aid, 330 Newark, N. J.; chlorine-ammonia treatment, 1349

steel pipe line; cleaning and lining; with bituminous enamel, 1350 with cement, 1013, 1352

tuberculation, capacity loss and, 1349

water quality, 1349
Newport News, Va.; Lee Hill pumping station, electrification, 116
Nitrite; see Chlorination; Chlorine,

free, determination

Norfolk, Va.; pump lubrication, 735 North Carolina; Coastal Plain, geology of, 484

drought, 482 rainfall, 479

North Carolina Section; 1936 meeting, 1797 North Dakota; water resources, 1270

North Jersey District Water Supply Commission; Wanaque Reservoir, manganese and, 1902 Wanaque supply, 978

Northern Pacific Railway Co.; Montana supply problems, 912

Oakley, Idaho; water supply, fluorine and, 1064

Odor; carbon addition and; dosage required, 523

ozone, coagulation and filtration, superchlorination, ammoniachlorine and aeration, comparison, 524

-free water, preparation, 510, 1623 hot and cold, ratio, 512 removal methods, comparing, pro-

cedure, 524 threshold value, acceptable, 1856 see Chlorination, taste and odor; Taste and odor

Odor determination: 1855 accuracy, 519 air dilution method: 513 osmoscope and, 513, 1856 bibliography, 527 glassware, care of, 511 metals and, interference, 511 nose-piece and, 509, 1856 results, expression of; pO scale, 521

threshold number and, 508 water dilution method; air-water ratio, importance of constant, 517 gas-liquid equilibrium laws and,

improved procedure, 507 repeated tests on same sample,

inadvisability, 519 Ohio; mine sealing, progress, 767 rate case regulations, 1701

Ohio River water; B. coli limits for various treatments, 768 Oklahoma City, Okla.; meter prac-

tice, 370 Oligodynamic action; discovery, 493

see Copper; Silver Oneida, N. Y.; impounding reservoir, wasting from bottom and, 1862

Oneonta, N. Y.; activated alum and, 1018

Oocystis; copper sulfate and, 177 Oregon; water resources, 1271 Ortho; neglected for indexing pur-

Oshkosh, Wis.; taste and odor, carbon and, 1864

Osmoscope; see Odor determination Owens River; water, boron content, 1453

see Los Angeles Oxygen; solubility in water, 514 Oxygen consumed; carbon filtration

and, 2003 Oxygen dissolved; reduction in corroding pipe system, 797

see Boiler corrosion Ozone; see Odor

orine

sage

tion,

nia-

eom-

623

pro-

lor:

21

d,

e,

Pacific Northwest Section; 9th annual meeting, 809, 945

Paint; purchasing, 643
see Concrete; Fire hydrant; Pipe coating; Tank

Pandorina; copper sulfate and, 177,

Paper; and pulp manufacture from slash pine, water quality and, 1975 waste, interference with alum coagulation, 1591

Parkersburg, W. Va.; flood of 1936, water supply and, 1849, 1851 Pasadena, Cal.; copper sulfate treat-

ment by spraying, 1471, 1472 Morris Dam; low-heat cement and,

1606 site, exploratory work and, 1606

Morris Reservoir, plankton control, 447 Passaic Valley Water Commission;

meter testing machine, 1620 Paterson, N. J.; see Passaic Valley

Water Commission Pennsylvania; flood; typhoid and,

water supplies and, 1835 typhoid, 682

water rates, 569, 570, 572 Penstock; welded steel, of unpre-cedented size and thickness, 1612

Peoria, Ill.; pollution abatement, 767 Pepperell, Mass.; Diesel drive, costs, Permanganate; feed apparatus, 1626

see Iron removal; Manganese re-Phoenix, N. Y.; Crenothrix, chlorine-

ammonia treatment and, Pipe; connections, 45°, making under pressure, 1618

line; exposed, painting, aluminum and, 1613

to filter plant, surge and flood prevention, 1876 obsolescence and, 209

Pipe, asbestos-cement; see Pipe, cement-asbestos

Pipe, cast iron; anchor clips, tests of, 655

breaks, frost and, 837 centrifugal, sizes, wider range

and, 1611 fittings; long vs. short, 652, 654

Los Angeles or short pattern, 190 joints; Leadite, 41

tests of, 651, 654

laying inside old wooden main, 104 line; construction, 39 cost, 42

friction coefficient; age and, 1333 of cement-lined, 1342 cleaning and; 1300

permanence and, 1300 of tar-coated, age and; 1293, 1344

pH and, 1293, 1297 Williams-Hazen tables, accuracy, 1293, 1296 typical American cities,

speciacations, sectional committee report, 651

strength, high, 1612

see Pipe, cement-lined; Pipe coating; Pipe joint; Services

Pipe, cement-asbestos; Transite; 1612 friction coefficient, 1342 see Services

Pipe, cement-lined; cost, 1346 friction coefficient; 1297, 1345 age and, 1298

see Pipe, cast iron; Pipe coating; Pipe, steel; Pipe, wrought iron; Services

Pipe coating; bitumastic, cost, 1346 developments, 1612

exterior, condensation-proof, 1624 interior; application, in situ, 1299 bitumastic enamel; centrifugally applied; friction coefficient, 1298

thickness, 1298 friction coefficient, age and,

improved, economic significance, 1344, 1369

Talbot, friction coefficient, 1342 mortar, early use of, 1995

dip, economic justification, 1345

see Pipe, cast iron; Pipe, cementlined; Pipe, steel Pipe, concrete; friction coefficient; 1301, 1342

age and, 1302

line, subaqueous, flexible joints, 1613

pre-cast, large, 1613 see Aqueduct; Concrete

Pipe, copper; use in new filter plant, 1557

see Services

Pipe flow; friction coefficient, air pockets and, 1342 see Pipe, cast iron; Pipe, cement-

soil stress test, 1378, 1381. lined; Pipe, concrete; Pipe, steel; Pipe, wrought iron 1386 Pipe, galvanized; alumina deposits stripping test, 1378, 1381. and, 752, 753 lime and, reaction, 753 1388 temperature, low and high, tests, 1383 Pipe joint; cement; cost, 1770 corrosion; pitting and; 1349 leakage, 1771 procedure, 1769 repair by welding, 1354 tubercles; bacteria and, 1350 sulfur-containing compounds, baccomposition, 1350 terial attack, 1046 see Pipe, cast iron; Pipe, steel tuberculation, capacity loss and, Pipe, lead; see Services 1349 developments, 1612 Pipe locator; new type, 1619 joints, cement, 191 line; cleaning; hand scraping and; Pipe, steel; cement lining, in situ; 1015, 1352, 1360 cement, characteristics, 1365 1351 mix, 1015, 1365, 1366 ventilation and, 1351 machine and; 1014, 1354 sand, characteristics, 1365 vs. hand, cost and, 1360 steam curing, 1016, 1363 permanently removable sections and, 1013, 1354 thickness, 1016, 1352 time and, 1016, 1364 friction coefficient; 1301 water-cement ratio, 1367 age and, 1340 coating; coal tar vs. asphalt, 1372 cement lining and, 1367 1393 cleaning and, 1367 coal tar enamel; application; centrifugal; 1394, 1401, 1407, lock bar, inserting large valve under pressure, 1618 1417 plant, 1395 subaqueous, encased in concrete, to exterior, 1402, 1409, 1613 see Electrolysis; Penstock; Services 1418 Pipe, by hand, 1393 Transite; see Pipe, cementhandling of coated pipe, 1419 asbestos Pipe, wood-stave; line, heating and, 1416 replacement, 39 new type (plasticised), 1373 priming, spray gun and, 1400, mains, replacement, 100 see Chlorination, taste and odor 1415 Pipe, wrought iron; line; cementsurface preparation, air lined, friction coefficient, 1298, 1345 blasting, steel grit; 1398, 1403 old, 23 oil and grease removal see Services and, 1414 Pitometer; see Distribution system; thickness, 1402, 1403, 1418, Leakage Pittsburgh, Pa.; flood, prediction re, 1419 lining; Bitumastic enamel, spun, pumping stations, electric, conthickness, 1613 with bituminous enamel in trol systems, 583 typhoid, flood and, 1843 situ; 1351 Pittsburgh-Des Moines Steel Co.; condensation, moisture prevention, 1352 paints for tank interiors, of, 646 gunite and, 1556 soil stress resistance, increasing, Plattsburg, N. Y.; reservoir improvements, 337 whitewash and, 1390 sun, protection from, whitewash Plumbing; cross connections and; 235, 242 and, 1390, 1403 education of public re, 697 testing; 1375 cold bend test, 1377, 1385 health department's responsi-

bility and, 696, 935 prevalence, 241

service check valves and, 236

siphonage and, 215, 247, 935

heating procedure, impor-

in place, electric flaw detector and, 1391, 1411

tance, 1380

Public relations; 1716

see Complaints

department, personnel and, 1718 drinking water cooler with exposed

meter in business office, 1624

welcome sign at plant and, 1623

Public Works Program; P. W. A.

water projects in Illinois, 1022 W. P. A. and water works oppor-

types, 221, 237 typhoid and, 231 dual supplies and; city supply through tank and, 71 distinctively colored piping and, 71, 249 filter in private building, dysentery outbreak and, 237 health hazards, survey; 214 cost, 218 vacuum in piping systems; 229, 248 prevention, check valves and, 229 see Cross connections; Hospital; Hotel; Milk; Water closet Pneumatic; see Tools Point Pleasant, W. Va.; flood of 1936, water works and, 1853 Pollution; B. coli limit for various treatments, 768 control, federal, resolution re, 806 interstate, compacts and, 765 Lake Michigan and, 898 legislative committees on, A. W. W. A. representative's appearances before, 1072 Special Advisory Committee of National Resources Committee; recommendations, 764, 1266 study, 1264 Pollution, industrial wastes; 1630 control, cooperation and, 767 see Gas and coke works; Mine; Paper Pollution, stream; control, progress, irrigation and, 913
Port Jervis, N. Y.; color reduction by drainage of swamps, 1857 copper sulfate treatment, 1860 Port Stanley, Ont.; water supply problems, 1931 Portage, Wis.; Diesel engine drive, costs, 124 Portland, Me.; filtration through magnetite, 1621 Potassium permanganate; see Permanganate

plan, 1698

ing station

782

381,

381,

igh,

nd,

id;

60

e-

e

tunities, 1032 Publicity; methods, 1168, 1200 value, 55, 684, 1167 Pump; check valves, tilted disc vs. hinged gate, loss of head and, 6 developments, 1614 pressure switch, automatic, 7 steam-driven, lubrication, 732, 736 see Well Pump, centrifugal; Colorado River aqueduct units; mechanical fea-A. W. W. A. tures, 1789 studies, 1615, 1786 drive; electric; 111 constant pressure variable speed motor and, 114 efficiency, 117, 868 speed variation, methods; 869 variable speed hydraulic coupling and, 870, 874 steam, high pressures, savings and, 875 variable speed, savings and; 869 steam vs. Diesel vs. electric, shaft deflections due to unbalanced radial forces on pump runner in open volute casing, 1788 see Bearing Pumping station; cleanliness, importance, 999 development, ultimate, study of, 984 drive; Diesel; advantages, 124 economies and, 119 operating cost; 121, 123, 125, 126 compared with steam, 125 Potomac Electric Co.; rate regulation suitability, caution and, 122 electric; advantages, 108 Power; see Electric; Engine; Pumpcontrol; automatic; 113, 586 float switch and, Pressure; dead end elimination and, hun mirk abox 1171 pressure or hydroelevated tank and, 782 static, 1174 fire; engine and, 1106 time clock and, 1177 protection and, 1105 methods, 583 mains, friction coefficient and, 1370 remote; 588 Providence, R. I.; manganese redirect wire, 589, 592 moval, 1902

supervisory; 589, 880 cost, 591 cost; initial, 110 operating, 118, 126 load factor and, 879 motor, selection, 111 protection equipment, 584 pump selection, 108, 115 natural gas engines, 1928 steam; boiler make-up meter, value, 994 coal consumption, determining, 992 discharge meter, indispensability, 996 instruments and, 991, 994 load factor and, 989 records and, 990, 997 equipment, selection, 984 fire protection requirements, 984, 1107 maintenance, 987

maintenance, 987
new, 57
obsolescence and, 212
operation; cost, elevated tank
and, 779
economy and, 1099
efficiency and, 983
see Boiler; Electric motor; Engine;

Well
Purification; B. coli limit for various
processes, 768
coloulations, slide rule for 1625

calculations, slide rule for, 1625 control, improper, typhoid and dysentery and, 694 plant, design, experimental plant

and, 1872 sewage treatment and, relation-

ship, 896
see Chlorination; Filtration; Manganese removal; Silver; Softening; Sterilization; etc.
Pyrolusite; see Manganese removal

Quincy, Ill.; services and mains, thawing, 1136

Racine, Wis.; water supply and sewage disposal situation, 903 Railroad supplies; corrosion preventions, sodium hydrate causticity

and, 915
softening; lime-soda, alum and
sodium aluminate and, 915
savings and, 472, 917
tubes and flues, life of, extension

and, 914 zeolite, 915 see Boiler Rainfall; drought; of 1934; Iowa and, 194 water supplies and, 194

North Carolina, 482 Iowa, 196 New York State flood and, 2 North Carolina, 479 Rochester, N. Y., 27 see Runoff

Ralston Creek; rainfall and runoff,

Rates; ability to pay as basis, in Great Britain, 211 cases, procedure, trend toward simplification, 1696 electric schedules, diversified, and

their application to water, 567 industries, concessions to new, 941 lawn irrigation and, 943 Los Angeles; 1210

irrigation and, 1236
making of, 52, 379, 938
minimum bill and, 388, 568, 581,
1198
"Loft work", 561

"off peak," 581
Pennsylvania, 569, 570, 572
schedules, complicated, inadvisability, 582, 944
Seattle, 941

service charge and, 568, 939 summer reduction, 1200 Waco, Tex., 1198, 1200 West Virginia, 571 See Fire protection: Fire

see Fire protection; Fire protection, private Reaction velocity; temperature and, 1513

Records; operating, importance, 1001 see Distribution system; Meter; Pumping station; Services; etc.

Red River of the North; National Resources Committee study, 1274 Reforestation; see Forest Refrigerator; cross connections and,

236, 936
Rensselaer, Ind.; service contracts, bank draft provision and, 1138
Reservoir; abandoned, conversion to

stadium, 1623 distribution, open; contamination and, 1045, 1047, 1048, 1049 obsolescence and, 210

filtered water, new, 62, 1880 impounding; design, fundamental considerations for Middle West, 193

drawing from different levels according to quality, 1862 evaporation loss, 196 recreational use, 208 wasting from bottom vs. over spillway, 1862

see Copper sulfate treatment; Corophium; Evaporation; Mosquito; Storage

Rhinebeck, N. Y.; Crenothrix, copper sulfate and, 1867 Rhode Island; water supplies, fluor-

ides and, 1064 Richmond, Va.; ammonia, ton con-

tainers and, 1621

carbon treatment, 1864

Ħ,

n

d

d

1

coagulation; chlorinated copperas and, 1594 flocculators and, 1526, 1593

paper waste, interference and. 1591

prechlorination, benefits, 1593

raw water preparation, improvements, 1591
Ridgewood, N. J.; well drilling, 2005
Rochester, Minn.; meters, reading and servicing, 262
Rochester, N. Y.; Holly fire system 24

tem, 24

iodide treatment, 28 hydrological meteorological and records, 27

rainfall and evaporation, 27 telegraph system, early, 26 water works, pioneering and, 22

wrought iron pipe line, early, 23 Rockaway, N. J.; typhoid epidemic, cross connection and, 1888

Rocky Mountain Section; 1936 meeting, 1793 Hill Cup award, 1808

Runoff; forest and, 1056, 1079 rainfall and, 197

Sacramento, Cal.; mixing; 1602 mechanical, 1525, 1526 spirovortex pump and, 1529 Sacred Heart Hospital, Tomahawk, Wis.; iron and manganese removal,

1491 Saint Louis, Mo.; plumbing, health hazards, survey, 214

Saint Paul, Minn.; trunk line survey,

Sampling apparatus; for composites, automatic, 1627

simple, 1621 San Francisco, Cal.; copper sulfate treatment; 1470

by spraying, 1471, 1859 cross connection survey and elimination program, 234 dysentery in building equipped

with filter, 237

mains, vacuum and, 239 meters, damage by hot water, 239 steel pipe line, Bay crossing, 1613 water supply; chemical quality, 1220

Hetch Hetchy project; 1211 benefits, 1218

Crenothrix, chloramine and,

dam, height, increase and, 1608

power production and, 1224 tunnel seepage, 1218, 1220,

iodine content, 1230 shrimps and, 1478

San Gabriel Dam; see Los Angeles County

Santa Anita Creek, Cal.; forest and stream flow study, 1082 Saratoga Springs, N. Y.; taste and odor, carbon and, 1864

water supply history, 1994 Seattle, Wash.; fire hydrants, paint-

ing, 1800 rates, 941

Sedimentation; tubidity removal, 538 Sedimentation basin; clarifier and;

peripheral weir and, 634 detention period, 538, 627 see Coagulation basin

Seneca Falls, N. Y.; algal tastes, carbon filtration and addition and, 1863

Services; asbestos pipe, 599 cast iron, 597

cement-lined, old, 1345 check valves on, 236

copper; 101 cost, 598

installation, boring and, cost, 1919

joints, 598 corrosion, enclosing in conduit and, 597

depth and, 838, 841, 852, 1062 frozen; 837, 843, 852, 1062, 1137 damage, materials, comparison,

thawing; air, heated, and, 1136 charging for, 862, 1136, 1137 cost, various methods, 863 electric; 838

cost, 1137 current required, 857 gasolinegenerator, driven, 854, 859 hazards and, 844

lead goosenecks, melting and, 857, 865 lead wires, size, 858 length and, 846 meter, removing prior to, advisability, fire and, 865 origin of, 1135 time and; 838, 845, 858 materials various and, 856, 859 welding machine and, 844, 1136, 1137 motor car exhaust and, 1136 steam and; 1136 cost, compared with electric, 855 gasoline-fired portable boiler and, 854 torches and wood fires and, wasting after, charging for the water and, 864 lead, 598, 852 materials, selection, 595 ownership, 908 records, 34, 738 steel, 597 valves, 599 wrought iron, 597 see Fire protection, private Sewage treatment; capital cost, 907 water purification and, relationship, 896 Sheboygan, Wis.; frost difficulties. 1137 water supply, 1114 Shrimp; see Corophium Silver; adsorption by glass from water, 1988 Daphnia and, 502 determination, 497 goldfish and, 503 microörganisms and, 493, 500 Spirogyra, 493 water sterilization; bibliography,

506 concentration and, 496, 505, 1983 contact period and, 499, 505, 1983 cost, 505 health and, argyrosis and, 593 history, 493 Katadyn and; 494 electro-; 494 concentration and, 499

automatic, 1483 H-ions, removal, 1514 and; 1483 pocket apparatus, 495 499 organic matter and, 494 Super-Ionite; re-activation, 1988 914 tests of domestic unit, 1983

temperature and organic matter and, 1984 treated water, bactericidal power of, 500 see Swimming pool

Simcoe, Ont.; iron removal plant. 1925 metering and consumption, 1927 water; cost, 1928 supply, 1923

Slide rule; for water purification calculations, 1625 Soap waste; hardness and, 472, 639,

801, 1222 soft water, saving and, 1874 softening, saving and, 639

Social Security Act; unemployment compensation, pertinent considerations, 1723

Society affairs; annual convention. 1798 Canadian Section, 657 Central States Section, 1793 Florida Section, 658 Illinois Section, 659, 1134 Indiana Section, 657 Kentucky-Tennessee Section, 806 Missouri Valley Section, 656, 1795 Montana Section, 809 New Jersey Section, 656, 1794 New York Section, 271, 656, 1794 North Carolina Section, 1797 Pacific Northwest Section, 809, 945 Rocky Mountain Section, 1793

Wisconsin Section, 1795 Soda ash; see Acidity; Coagulation; Corrosiveness; Hydrogen-ion concentration; Iron removal; Softening

Southwest Section, 1796

Virginia Section, 142, 1797

Sodium aluminate; see Color re-moval; Railroad Sodium carbonate; see Boiler water;

Soda ash Sodium hydroxide; see Corrosiveness; Iron removal

Sodium sulfate; see Boiler corrosion Sodium sulfite; see Boiler corrosion Softening; base exchange; 1481

corrosiveness and, 1514 iron and manganese removal

over-run method, 1485 regeneration, salt consumption,

sodium sulfate, interference and,

zeolite, attrition loss, 1484 cost, 473 economics of, 469 hardness, final, 638, 749, 932, 1484, lime; excess; alum and, 1946 magnesium; coagulating effect, 1946 removal, 932, 1946 and recarbonation; 932 cost, 933 soda ash and recarbonation; 628 alum and, 633 carbon and, 634 chlorinated copperas and, 634 clarifier and, 628 ferric chloride and, 634 sludge recirculation, 633 sterilization and, 933 taste removal and, 933 ferrous sulfate and; 539 cost, 541 pH and, 541 iron removal and, 1590 settling period, 539 -soda; clarifier and; efficiency, 750 sludge, solid content, 750 diabetes and, 917 mixing period and, 750 settling period, 750 sodium bicarbonate waters as source of soda, 916 split treatment, 749 sterilization and, 917 plant cost, 473 savings and, 473 see Carbonation; Railroad; Soap Soil; erosion, forest and, 1057, 1082 frost penetration, 837, 841, 851, 1063 moisture determination, plasticity needle and, 137

see Dam; Forest

and odor, 754

filtration, 1863, 1998

South Dakota; water resources, 1270 South Fallsburg, N. Y.; taste and odor, superchlorination and carbon

water quality, 1998 South Pittsburgh Water Co.; taste

Southern Pines, N. C.; taste, black alum and carbon and, 1019

Southwest Section; 1936 meeting, 1796

Spartanburg, S. C.; red water troubles, 1979

Spirogyra; silver and, 493

treatment experiences, 749

er

it,

l-

9,

water supply and, 1913 see Typhoid Steel; electrical resistance, 857 see, Pipe, steel; Services Sterilization; see Chlorination; Lime treatment; Silver Stockton, Cal.; small mains, air and water flushing, 1623 Storage; elevated, advantages, 778 fire protection and; 1105, 1108 ground storage and, 701 type selection, 1919 see Reservoir; Tank; Water, ground Stream; flow; forest and; 1079 fire and, 1081 New York State flood and, 4 gaging, need of, 4 see Pollution; Runoff Sulfurie acid; see Coagulation Sunlight; depth of penetration, 449 Super-Ionite; see Silver Swimming pool; chlorine-ammonia treatment, method, 1625 cross connections and, 225, 228 salt water, color removal, black alum and, 1622 scum, removing, 1622 silver sterilization, dosage, 496, 500 Synura; taste, carbon and, 1865 Tampa, Fla.; chemical solution control device, 1624 Tank; altitude valve and, 10 elevated; concrete; construction, Hewett system, 46 early difficulties, 45 fire protection and, 782 pressure improvement and, 782 pumping cost reduction and, 779 size required, determination, 782 painting; 640, 1920 interior and; 644 test, extensive, 646 wash water; 62 concrete; construction, 45 new, 1561, 1881 see Storage Taste and odor; carbon and; 1063 black (activated) alum and; 1019 added to reservoir, 1866 powdered; application; to filters after washing, 1019, 1864 point of, 632, 637, 756, to reservoir, 1865 dosage; 637, 755, 1019, 1021, 1864

Springs; flow, forest and, 1054

required, determination, 1865

chlorination, ammonia and, 1063 coagulation, iron and lime and, 1906 Crenothrix and, 1867

distribution system, production in and control, 1866

electric circuits, grounding to water pipes and, 468 gasoline and, superchlorination

and, 1863

lime, excess, and, 933 microörganisms, carbon and; filtration, 1863

powdered, 608

organic matter and, 1871 springs used because of, typhoid and, 688

superchlorination and; 1863 and carbon filtration, 1863 swamps, draining and, 1857

Synura and, carbon addition and, 1865

see Chlorination, taste and odor; Odor

Taxation; of water works, Wisconsin statistics, 350

Teeth; mottled enamel, fluorine and; 107, 1064, 1461

concentration and; 649, 805, 1066, 1463

minimal threshold, 804 damage suit and, 648 diet and, 1461

form of, and, 1462 staining, manganese and, 1041 Temperature; see Corrosiveness; Hydrogen-ion concentration; Reaction

Tennessee Valley Authority; dams, 1604

Texas; rates, regulation, 379 water; resources, 1271 works, ownership data, 379

Tokyo, Japan; consumption, 720, 721 water supply and purification, 720 o-Tolidin; see Chlorine, free, de-

termination
Tools; pneumatic, lubrication, 734
Topeka, Kans.; softening and coagulation data, 1946

lation data, 1946 Toronto, Ont.; superchlorination, 508 Treatment; see Purification

Trout; copper sulfate and, 456 Trypaflavine broth; see Bacterium coli test

Tunnel; branched, surge tests; 295 models and, accuracy, 295, 314 friction coefficient, 306 new, large and cost, 1617 water supply, seepage of highly mineralized ground water, 1218, 1220, 1230

Turbidity; determination, illumination, mercury vapor lamp and, 1625

high, lime and; 637, 933
ferrous sulfate and, 539
-soda softening and coagulation
and, 627

see Coagulation
Two Rivers, Wis.; consumption, 610
hydrant rental, 610

purification; cost, 610 plant, new, 606

Typhoid; cross connections and; 1887 plumbing and, 231 epidemics, water-borne; cross con-

nections and, 215, 1887, 1888 springs used owing to unpalatable public supply and, 688

flood and, 1843 Pennsylvania, 682 purification, improper control and, 694

statistics; large cities of United States—1935, 1122 nonresidents and, 1124

Unemployment; see Social Security Act

United States; see National Resources Committee; Public works program; Social Security Act United States Bureau of Reclama-

tion; Boulder Dam penstocks, 1612 Upper Rio Grande River; National Resources Committee study, 1272

Valuation; rate case procedure, trend toward simplification, 1696 for rate making, 381 see Depreciation

Valve; altitude, 7, 10, 184 butterfly, large, extending use of, 1618

closure by excessive velocity, 15 large, inserting under pressure, 1618

pressure reducing; 7, 9, 184 noise and vibration, avoiding, 184 relief, 7

stem, repacking, 183
see Distribution system; Pump
Valve, check; see Cross connections;
Pump

Vapor pressure; odor determination and, 515

Venturi meter; maintenance, 1575 Victoria, B. C.; watershed control and protection, 1075 Vinegar manufacture; silver sterilization and, 496
Vineland, N. J.; water supply, emergency connection to private system, 1894
Virginia Section; 1935 meeting, 142
1936 meeting, 1797

18,

ıd,

on

0

n-

8-

i,

d

Waco, Tex.; metering, 1198
rates, 1198, 1200
water supply; 1198
administration and, 1199
Wagonwheel Gap, Col.; forest and
stream flow studies, 1079
Waltham, Mass.; concrete tank, seepage, 47

age, 47
Washington, D. C.; corrosiveness, treatment, hardness increase and, 801
Washington State; water resources,

1271
Washington Suburban Sanitary District, Md.; metering, 841
sweatproof paint for pipes, 1624

Waste; detection, Memphis machine and, 1765 fixture survey, 1940 reducing; economy and, 1097 publicity and, 1010

see Leakage
Water; uses, order of importance, 763
Water analysis; mineral, expression
of results, ionic strength and, 1507
see Bacterium coli test; Microscopic examination

Water closet; flushometer, siphonage and; 215, 229, 248 vacuum breakers and, 238, 240, 248

see Plumbing Water cost; New Orleans, 541 Simcoe, Ont., 1928 Water, gratuitous; 53, 383

Water, ground; artificial storage by spreading; 1240

basin method, 1246
furrow or ditch method, 1245
percolation, unit rates, 1250
spreading area, selection, 1241
stream channels and, 1249
water rights and, 1244
wells and shafts and, 1248
contamination; artesian condition

contamination; artesian conditions and, 1959 distance and, 1960 factors, 1954 rock interstices and, 1956 movement, rate, determining, 1960 rocks, classification and waterbearing properties, 1955 see Infiltration gallery; Spring; Well Water, mineral; therapeutic value, 1038

see Mineral content

Water quality; A. W. W. A. convention city requirement, 253, 254 boron, significance, 1450 Cl. welchii, significance, 1048 deterioration in distribution systems, 1044

fluorine, permissible amount, 650, 1463

hardness; acceptable, 1112 health and, 1039

iron; health and, 1041
permissible amount, 1112
mineral salts, physiological effects, 1038
odor, threshold value, acceptable,

odor, threshold value, acceptable 1856 requirements, 212

responsibility, ends where?, 216 silver, health and, 503 standards, trend, 683

see Bacteria; Bacterium coli; Disease; Pollution; Purification; Teeth; etc.

Water resources; basic information, collection of, 1259 California and, 1285 committee on national water

policy, report, 1068
conservation, 757

drainage basin; regional planning and, 1604 studies, 1275

federal activities; recent, 1252 state activities and, coördination, 1261

reforestation and, 1051, 1079 western arid and semi-arid states, problems, 1268 see National Resources Committee

Water rights; see Water, ground Water supply; adequacy, 1110 continuity, ensuring, 210 drought and, 194

emergency connection to private supplies and, 1893 fire insurance rates and, 986

number in United States, 690, 1167, 1424 progress, 681

properties not served, survey, Marshalltown, Ia., 1201 public, definition, 1893

and public health work, interrelation, 695

small municipalities and: planning. problems, 1911 sources, data, 106 state control, 693, 1887 surface, problems, 1911 see Fire protection; Purification: Water, ground; Water works; etc. Water unaccounted for; Memphis, Tenn., 1764 Water works: beautification, 687 earthquake and, 908 employees; political interference and, 691, 999, 1007, 1424 suggestion box and, 1020, 1624 training schools and licensing, value demonstrated in emergency, 1853 transfer of duties, 1692 engineering, educational situation and, 921 flood and: 1835, 1846 preparedness and, 1844, 1851, 1854 grounds, raw water sprinkling system, 1883 obsolescence and, 207 ownership data, 106, 208, 379, 690, planning, constructive, economies and, 1697 statistics, Water Resources Committee and, 1271 superintendent, problems and, 1007 telegraph system, pioneer, 26 see Administration; Billing; Financing; Fire protection; Public works; Publicity; Water supply; Watershed; access; medical certificate and, 1075 permit and, 1075 British Columbia regulations; 1077 bathing, prohibition, 1078 camps and, 1078 latrines and, 1078 ownership, 56 recreational use, 208 see Forest Wausau; iron and manganese removal, 1489 Well; ancient, 1110

construction, 267

casing, sealing into rock, 2007

records, importance, 2006

specifications and tender forms,

codes and licensing of drillers,

drilling; 2005

2005

earthquake, flow increase and, 910 flood and, 1852 gravel wall, 1916, 1925 obsolescence and, 213 pollution; location, slope of water table and, 1960 pumping, effect of, 1961 pumping; deep; air-lift; 362 efficiency, 363 bucket pumps and, 361 developments, 1615 electric drive, remote control: 781 direct wire, 593 lubrication, automatic, 1921 selection of equipment, 365 testing: 2008 adequate period and, 365 turbine and; 363, 1916 and booster, 366 efficiency, 364 history, 363 lubrication, oil vs. water, 364 water level, provision for determining, 367 electric, automatic control; 1175, 1178, 1917 installation cost, 1179 house, electric heating and, 1922 salt water and, pumping control by chloride or conductivity recorder and, 1627 sewers, tile, distance and, 937 supply, problems, 1914
see Water, ground
West Virginia; flood, 1936, water
supplies and, 1846 mine; sealing, progress, 768 waste, manganese and, 1902 water; rates, 571 works employees, training and licensing, value demonstrated during flood, 1853

Western New York Water Co.; meter

reading, billing and collecting, 30 Wheeling, W. Va.; flood, 1936, water

works and, 1850 Wilmington, Del.; frost difficulties,

Winnetka, Ill.; alum solution prepara-

Winona, Minn.; distribution system

Wisconsin; depreciation rates, Public

Service Commission and, 348 fire protection revenue data, 354

washer, ice and, 840

sand filtration, Blaisdell

837

slow

tion tests, 74

maintenance, 402 leakage survey, 405 unemployment compensation, 1728 water; ground, 1113

910

ter

5

works, statistical comparison of operating and turn-over ratios, depreciation, taxes, revenue, etc., 342

etc., 342 Wisconsin Section; 1936 meeting, 1795 Worcester, Mass.; cement-lined services, 1345

Worms; from drain entering tap,

CANABITE, S. A., modern modelle of controlling electronic operated instance of, 1047
see Chironomus
Wrought iron; see Iron, wrought;

Wrought iron; see Iron, wrought Pipe, wrought iron; Services

Yellowstone River; water quality deterioration, irrigation and, 913

Zinc; see Pipe, galvanized Zurich, Switzerland; city forest, 1060

Agent ace, A. H., resonance as an Alexandra and an area and a series and a sphorough and a sphorough and area a sphorough and area a sphorough and a series a contain a series and a series area.

## AUTHOR INDEX

Adams, F. P., Grand River water supply and flood prevention, 1117

AMSBARY, F. C., JR., thawing service pipes, 856

ANDERSON, A. B., reconditioning an old water main, 1013

Arnold, G. E., back-siphoning and cross connections, 234

plankton and insect larvae control in California waters, 1469

BABBITT, H. E., the educational situation in water works engi-

neering, 921 BANKS, T. G., water department

budgets, 741
Banks, W. G., and Inglee, C., the rehabilitation of large water mains in Newark, New Jersey,

BARBOUR, F. A., what's ahead for A. W. W. A., 1165

economic significance of improved pipe linings, 1344 discussion, 1629

Baty, J. B., supervision of cross-con-nections by the New Jersey State Department of Health, 1885

BAUER, C. H., Public Works Administration water projects in Illinois, 1022

BAYLIS, J. R., AND GULLANS, O., an improved odor test on water, 507 Billings, L. C., selection of coagulants, 1943

BLOHM, A. W., summary—damage suits for mottled enamel from public water supply at Chetopa, Kansas, 648 Bouson, F. W., experiences with the

treatment of Monongahela River

water, 748
Breen, W. G., water works problems of a small municipality, 1931

BREITKREUTZ, E. W., practical prob-lems in water distribution, 180

record control of the construction, maintenance, and operation of a

distribution system, 1756 Brossman, C., elevated tanks for water works systems, 778

Brown, K. W., coagulation, 1533 Broz, F. J., problems of the ordinary superintendent of water, 1007

BRUSH, W. W., obsolescence in water works equipment and operating methods, 207

the past year in the distribution field, 1617

CANARIIS, S. A., modern methods of controlling electrically operated

pumping stations, 583 CAPEN, C. H., JR., history of the development of the use of water in northeastern New Jersey, 973

CARR, J. A., experiences in well con-

struction, 2005 Casad, C. C., the development of the Bremerton, Washington, water

system, 97 COUGHLEN, H. G., Jr., efficiency in

water plant pumping station operation, 983 Cowles, M. W., present status of the electrical grounding problem as related to the formation of the American Research Committee on Grounding, 1735

Cox, C. R., recent advances in the control of chlorination, 1090

a review of recent progress in the elimination of tastes and odors from water supplies, 1855

CUNNINGHAM, M. B., meter shop practice, 369

Davis, A. R., specifications for water main construction, 356

DE COSTA, J. D., Orinda filtration plant of the East Bay Municipal Utility District, Oakland, Cal., 1551

DENSON, L. A., North Carolina rainfall, 479

DERBY, R. L., methods of testing and significance of boron in water, 1449

DEVENDORF, E., water works con-struction in New York State with federal aid, 330

DONNELLY, E. J., purification plant at Two Rivers, Wisconsin, 606

DONOHUE, J., is your water supply adequate for domestic and industrial purposes?, 1110
DORION, R., a pitometer water waste

survey in Lachine, Que., 1937

ECKART, N. A., benefits accruing from the Hetch Hetchy project, San Francisco water supply, 1211

EYER, C. W., a year's operating ex-perience at the Glendive water softening plant, 932

FARRELL, M. A., the comparative study of nine presumptive test media, 611

FIEDLER, A. G., the occurrence of ground water with reference to contamination, 1954

FLEMING, D. H., water works prob-lems of the smaller municilems of

palities, 1910
FORESTER, D. M., treatment of the Colorado River water, 627

FOULK, C. W., suspended solids in the foaming and priming of boiler water, 528 France, R. L., a comparative study

of certain presumptive media for

testing raw waters, 785
FRIEDRICHS, C. C., JR., purification methods at New Orleans, 537

FRISK, P. W., water purification difficulties with spore-forming bacteria and high concentration of organic matter, 623

GALLAHER, W. U., treatment of Fox River water by the silver mineral process, 1983

GAYTON, L. D., unprecented low temperatures and their effect on the Chicago water supply system,

Goit, L. E., steel pipe cleaning and coating plant of the Bureau of Water Works and Supply of Los Angeles, 1393

GOLDSMITH, C., AND TATNALL, G., better fire protection for the smaller communities, 699

GORMAN, A. E., safeguarding public water supplies from source to consumer, 65

GOUDEY, R. F., a new method of copper sulphating reservoirs, 163

residual chlorination on the Los Angeles system, 1742

GRIME, E. M., railroad water supply problems in Montana, 912 Gullans, O., see Baylis, J. R.

HALE, F. E., iron removal without aeration—the precipitation of ferrous carbonate in a closed system, 1577

HARRINGTON, A. W., rainfall and stream flow conditions during floods in central and southern New York, 1

HARRIS, C. F., and Nairne, J. I., discussion—tank painting, 640

HARRIS, H. A., JR., experience with automatic control equipment at

pumping plants, 1170 res, H., laboratory control of protective treatment of steel HAYES, H., pipe lines by the Bureau of Water Works and Supply of Los Angeles, 1372

HAYES, M. D., pioneering in the water works field, 22

HECHMER, C. A., frost difficulties and experiences during the past winter, 841

HEPLER, J. M., see Mallmann, W. L. HERTY, C. H., the quality and fitness of our deep well water for the manufacture of pulp and white

paper from slash pine, 1975 HEUKELEKIAN, H., see Schulhoff, H. B.

HEWETT, A. L., water tanks of reinforced concrete, 43

HOPKINS, E. S., problems in coagula-tion and corrective treatment,

Hoskinson, C. M., mixing, 1522 Houston, J. C., Jr., how one com-

pany meets its problems of meter reading, billing, and collecting,

HOWARD, N. J., water quality de-terioration in distribution sys-

tems, 1044
Howson, L. R., Denver's west side filter plant, 1873
HURLBUT, W. W., modifying an unusual filter plant to operate successfully, 1868

INGLEE, C., see Banks, W. G. IRWIN, G. M., watershed protection and control, 1075

IWASAKI, T., the Tokyo water works,

JACOBS, N. B., diversified electric rates and their application to water companies, 567

JENKS, H. N., filter design as related to operation, 1541

Johnson, D. W., hazards in use of public water supply system as a ground for electrical circuits, 458

Johnson, W. S., a survey of potential health hazards due to faulty plumbing, 214

JORDAN, H. E., water supply, public health and politics, 690

JUST, J., and SZNIOLIS, A., germicidal properties of silver in water, 492

KILLAM, E. T., digest of report of N. E. W. W. A. committee on pipe line friction coefficients effects of age thereon, 1293

KIRCHOFFER, W. G., the use of beds of manganese ore in iron and manganese removal, 1488

LANE, D. A., artificial storing of ground water by spreading, 1240 LANGELIER, W. F., the analytical con-

trol of anti-corrosion water treatment, 1500

Law, M., see Parks, W. G.

LEASK, S., JR., unemployment compensation: some pertinent considerations, 1723

Lee, R. E., utility accounting methods, 389

LEIPOLD, C., preparation and conditioning of aluminum sulphate solution before applying to water,

V., LEONARD, W. domestic water supplies of Idaho, 106

LEWIS, L. L., air conditioning in relation to water consumption,

LEWIS, L. L., AND POLDERMAN, L. H., modern air conditioning-what it means to the water utility, 1181

LIPPINCOTT, J. B., the dual usage of water for domestic and irrigation purposes, 1232

LUPIEN, J. E., the earthquakes of 1935 and the Helena, Montana, water system, 908

Magnus, H., distribution system maintenance, 402

MALLMANN, W. L., AND HEPLER, J. M., a comparative study of standard methods of water analysis and two percent bile brilliant green lactose broth confirmation, 411

MAVIS, F. T., see Waterman, E. L. McAfee, H. D., correction of faulty plumbing, 935

McCaffrey, J. E., public relations, 1716

McCorp, C. M., the Memphis meter

and leak tester, 1764 McFAUL, W. L., the water filtration plant of Hamilton, Ont., 57

McGuire, M. H., the small town water system, its problems and perplexities, 50

MEITES, H. L., overcoming public opposition to water meters, 1712 MICHAEL, A. C., model and full size

tests on large branched tunnel system of Detroit water supply, 295

MINICHAN, D. P., economies in the selection and operation of electric power for pumping equipment,

Moke, E. W., statistical comparison of water departments of Wisconsin cities, 342

Morris, S. B., dams, pipe lines and

pumping, 1604
Moses, H. E., water works experiences from a health official's viewpoint, 681

the 1936 flood and Pennsylvania public water supplies, 1835

Morr, S. J., the water supply of Saratoga Springs, N. Y., 1994 Murphy, F. M., materials for service

connections, 595

experience with cement water main jointing materials, 1768 Myers, A. H., the Works Progress

Administration and water works opportunities, 1032

NAIRNE, J. I., see Harris, C. F. Nichols, M. C., factors in making rates, 379

NIEMEYER, H. W., meter sizing, 882 NORDELL, E., iron and manganese removal by zeolites and manganese zeolite processes, 1480

PARKS, W. G., ROBINSON, M., AND Law, M., fluorides in the natural waters of Rhode Island, 1064

PEDERSEN, H. V., some interesting facts uncovered in a survey of properties not served with city water, 1201 PERHAB, J. L., maintenance of filter

plant equipment, 1571

PETERSON, A., reducing the cost of centrifugal operating works pumps, 868
PHILLIPS, W. B., the lubrication of

water works equipment, 730
PLOWMAN, E. G., reorganization experiences in Denver, 1933-1936, 1686

POLDERMAN, L. H., see Lewis, L. L. POLLARD, C. B., physiological effects of mineral salts in natural waters,

PROCTOR, R. R., soil compaction control for rolled earth dam construction, 134

PROUTY, W. F., geology of the Coastal Plain of North Carolina, 484

Reilly, R. T., water supply filtration and sewage treatment in cities bordering Lake Michigan, 896

RICHARDSON, A. H., reforestation and water resources, 1051 Robinson, M., see Parks, W. G.

Rohan, G. J., operating experiences at Waco, Texas, 1198

Roos, C. M., operating records, 1001 RUSSELL, W. S., Diesel engines in the water works field, 119

SANCHIS, J. M., methods of testing and significance of fluorine and fluorides in water supplies, 1456

SCHAEFER, F. A., water meter construction and operation, 770 Schinman, E. P., taste and odor re-

moval at South Fallsburg, N. Y.,

SCHULHOFF, H. B., and Heukelekian, H., a direct plating method for the determination of the potability of water, 1963

SCHUNKE, G. B., water rates, 938 SCHWARTZ, J., present trends toward simplification of rate case procedure, 1696

Schwarz, E., reading and servicing meters, 262

Shaw, F. R., conserving our national water resources, 757

SIMMS, R. B., red water troubles and low temperatures of winter of 1936, 1979

SMITH, H. F., the trend of customer accounting practice, 1677

SMITH, M. C., developments in raw water preparation and the use of chlorinated copperas at Rich-

mond, Va., 1591
Sopp, C. W., plankton control in
Morris reservoir, 447

SOUCEK, E., see Waterman, E. L. SPILLMAN, M., pumping stations on the Colorado River aqueduct,

1786 STALKER, W. D., some problems of a

water works plant in a small municipality, 1923
STANLEY, C. M., economies of water softening, 469
STUART, F. E., new water works

operating practices, 1017

seen and heard in the field, kinks, gadgets, ideas, 1621 Szniolis, A., see Just, J.

TATNALL, G., see Goldsmith, C. THANE, H. S., well programs at Missoula and Hamilton, Montana, 266

THOMAS, A. H. R., mechanical control in water works operation, 6

THOMPSON, L. N., trunk line pitometer survey, 406

TISDALE, E. S., the 1936 flood and West Virginia public water supplies, 1846

TRENTLAGE, L., the relative impor-tance of the meter division to the water department, 885

Twony, F., application of tabulating equipment in accounting procedure, 1704

VAN NORMAN, H. A., romance in the development of the Los Angeles water supply, 1205 Van Zandt, W. K., location records

of mains and services, 738

VEATCH, F. M., planning additions to the distribution system, 602

Vojcsik, L., flushing large supply mains in Budapest, Hungary, 257

WAGNER, R. F., replacing wood with cast iron pipe under P. W. A. regulations, 38

WARD, C. N., deep well pumping, 361 WARING, F. H., proper water supply and drainage piping for hotels, 242

WATERMAN, E. L., Mavis, F. T., and Soucek, E., fundamental hydrologic considerations for the design of impounding reservoirs in the Middle West, 193

Middle West, 193
WILKINSON, J. B., is your water supply adequate for fire protection purposes? 1103

WILLCOMB, G. E., iron and manganese

in water, 1896
WILLS, W. C., frost difficulties and
experiences during the past winter at Wilmington, 837

Wilson, E. K., economies effected by constructive planning, 1097 conditions of mains in typical American cities, 1304

Wolman, A., some recent federal activities in the conservation of water resources, 1252

WYCKOFF, W. W., design of earth fill dams, 127

ZERMAN, S. W., the attorney system as a modern method of collecting water accounts, 1669

## INDEX TO ABSTRACTS

I. Authors ARRAMS, A., AND WAGNER, C. L., 281 ABWESER, C., 1827 ACKER, J. E., see FISHER, L. M. ACKLIN, O., 548 ACKLIN, O., AND VUILLEMIN, R., 545 ADAMS, B. A., AND HOLMES, E. L., 430 Adams, C. F., 970 Adams, R. C., Jr., see Solberg, T. A. AHLQUIST, H., 558
AICHER, A. V., 2032
AINSWORTH, N. J., 547
ALFANO, S., 814
ALLYNE, A. B., 815
ALNUTT, B. S., 1665
AMIANTOV, A. I., 432, 1658
AMMER, G., 2031
ANDERSON, E. H., AND STRUME Anderson, G. W., Hamblen, A. D., and Smith, H. M., 1436 Transa ANDERSON, O. L., 280 ANDERSON, P., 2017
ANDREEV, N. N., AND ANDREEVA,
E. V., 1658, 1825
ANDREEV, N. N., AND AVTONOMOVA,
E. S. 1659 E. S., 1658 Andreeva, E. V., see Andreev, N. N. Armand, and Languet, 547 ARMAND, AND LESCOEUR, 548 ARMSTRONG, C. G. R., 423
ARRANT, H. H., 968
ARTUS, A., 547 ARTUS, A., 547 ATKINS, W. R. G., 432 ATKINSON, N., 1149, 1821 AUGUSTI, S., 1656 AUGUSTI, S., 1656 AUSTERWEIL, G., 549 AVTONOMOVA, E. S., see ANDREEV, N. N. AXELROD, M., see DAMERELL, V. R.

BAARS, J. K., 548 BAAS-BECKING, L. G. M., see MAS-BAAS-DECARD, SINK, A.
BABLIK, H., AND KRYSTOF, J., 1151
BABSON, J. C., 2013
BACH, H., 149, 818, 2030
BAENTSCH, S., see KÜHL, H. BAER, J. K., 546

Bahlman, C., 2033 Bair, M. Z., 952 Baldwin-Wiseman, W. R., 966, 967 BALDWIN-WISEMAN, W. R., 966, 967
BALL, C. G., see THIESSEN, G.
BALL, W. C., see CHILDS, A. E.
BANKS, T. G., 969
BABBER, C. L., 2027
BARBOUR, F. A., see KILLAM, E. T.
BÄRENFÄNGER, C., 1143
BARNES, G. A., 2017
BARR, G., AND THOROGOOD, A. L., 547
BARSOV, K., AND SOCHILOVA, A., 1153
BARTOW, E., 559, 660 BARTOW, E., 559, 660 BARTOW, E., BLACK, A. P., AND SANSBURY, W. E., 437
BASSETT, H. N., 429, 1821
BAUGH, E. A., 970
BAYLIS J. R. 155, 270, 560, 665, 963 Baylis, J. R., 155, 279, 560, 665, 963, 1142, 1434 Beach, E. F., see Rakestraw, N. W. BEACH, E. F., SEE HARESTRAN, S. BEAN, E. L., 677
BEAN, S. K., 829
BEARD, F., 970
BEARD, P. J., 551
BEAUCHEMIN, A. O., 1661
BECK, H. H., AND WECKEL, K. G., 2026 BECK, J. A., 833
BELYAEV, N. I., 1657
BENNETT, C. S., 147
BENSON, H. K., AND PARTANSKY BENSON, H. K., AND PARTANSKY A. M., 2027 BERG, R. O., see ZIMMERMAN, P. W. BERGMAN, H. F., 820 BERNARD, M. M., 437 BERNHAGEN, L. O., 969 BERRY, A. E., 290, 1831 BESIG, F., 665 BÉTANT, A., 676 BIERT, J., 441 BILLINGS, C. H., 15 BIERT, J., 441
BILLINGS, C. H., 15
BILLINGS, C. H., 15
BILLINGS, L. C., 440, 1664, 2016
BINGHAM, C. F., 1814
BINGHAM, W. F., see LANE, E. W.
BIRKE, H. D., 436
BISHOP, L. M., see FITCH, C. P.
BITHER, T. A., 954
BLACK, A. P., see BARTOW, E.
RLACKWELDER, C. D., 1829 BLACKWELDER, C. D., 1829

Brand H. Starte V. M. C. D. Black St. C. D. Brand V. D. Brand V. C. D. Brand V. C. D. Brand V. C. D. Brand V. C. D. Brand V. C

BLAIR, H., see SMITH, O. M. BLANNING, H. K., AND RICH, A. D., BLEICH, S. D., 438 BOLEICH, S. D., 438
BOATMAN, L., AND KERSHAW, N., 825
BOETTCHER, F., 1826
BOGUE, R. H., 671
BOHMANN, H. P., 1661
BOISSEVAIN, C. H., 824
ROLE, G. A., 550 BOISSEVAIN, C. A., 559
BOLE, G. A., 559
BONNER, F. E., 552
BONNYCASTLE, W. R., 2024
BOOTH, H. S., 2034 BOSSUET, R., 1825 BOWLUS, F. D., see PALMER, H. K. BOWMAN, J., 1143
BOYCE, E. W., 159, 2016
BOYD, W. L., see FITCH, C. P.
BOYER, J. A., 970 BOYNTON, P., 1163 BOYNTON, P., 1163
BOYUM, I. L., 153
BRAGG, R. M., 440
BRAHTZ, J. H. A., 435
BRAMWELL, C. B., 433
BRANCATO, F., 1145
BRANNER, G. C., 159
BREDBERG, L. E., 153, 1821
BREITKREUTZ, E. W., 561, 1814
BRENDER À BRANDIS, G. A., AND
KEEMAN, W., 666 BRENDER A BRANDIS, G. A., AND
KEEMAN, W., 666
BRENNEKE, A. M., 969, 1815
BREVER, H. B. G., 445
BRIDGE, A. F., 1652
BRILL, H. C., see FOULK, C. W.
BRITTON, J. C., 2031
BROWN, C. E., 422
BROWN, J. W., 968
BROWN, J. W., 968
BROWNLIE, D. 1816 Brownlie, D., 1816 BRUHNS, G., 819 BRUNS, H., see SIERP, F. BRUNS, H., see SIERP, F. BRUNS, H., AND PABST, 1818 BUCHANAN, E. B., AND DODGE, J. K., BUCHANAN, E. V., 288
BUNKER, G. C., 1441
BUGGO, G., 1817
BURCH, L. R., 150, 560
BURDICK, C. B., 1434
RUPNICK F. H. 834 BURDICK, E. H., 834 Burgess, P., 2033 BURKHART, E. C. M., 970 BURKHOLDER, J. L., 553 BURT, C. S., ET AL., 962 BUSWELL, A. M., 1434 BUTTERFIELD, C. T., 666 see Hoskins, J. K. Byers, H. G., see Williams, K. T. see MILLER, J. T. BYRAM, A. T., see JOHNSTON, E. W.

CAIN, E. A., 968 CAIRD, J. M., 291 CALVERT, C. K., 667 Calvert, C. K., 667
Cameron, T. W. M., 1830
Camp, T. R., 156
Campbell, E. W., 292
Campion, H. T., 834
Capen, C. H., Jr., 155, 825, 1814
Carlson, R. W., 290, 558, 669
Carlyon, L. D., 964
Carpenter, L. V., 1142, 2033
Carpenter, L. V., and Herndon, L. K., 425 L. K., 425 CARPENTER, P. L., FULTON, M., AND STUART, C. A., 672 STUART, C. A., 672
CARR, C. J., see Dozois, K. P.
CARTER, G. O., 143
CASSONI, B., 663
CHADWICK, H. D., 1156
CHARLES, J. R., 1664
CHARLES, R. S., 674
CHARLTON, D. B., AND LEVINE, M., 672 MINANO, B., BM CHASE, E. S., 674 CHASE, E. S., 674
CHAUDRON, G., see GIRARD, A.
CHESNY, H. H., 1446
CHILDS, A. E., AND BALL, W. C., 826
CHRISTIERNIN, G., 1656
CHRISTMANN, W., 661
CHULKOV, Y. I., 1817
CHURCH, J. E., 422
CIANCI, V., 668
CLAGGETT, A. D., 2032 CIANCI, V., 668
CLAGGETT, A. D., 2032
CLARK, A. T., 275
CLARK, A. W., 1667
CLARK, A. W., AND WILLITS, C. O., 1446
CLARK, C., 969
CLARK, D. S., 1148
CLARK, E. W., 1661
CLARK, H. W., 158
CLARK, L. M., AND COUSINS, W. R.,
431 431 CLARK, L. M., AND HAMEE, P., 430 CLARK, L. M., AND HUNTER, E., 1828 CLARK, N. A., AND SIELING, D. H. 2026
CLARK, W. M., 2027
CLARVOE, G. W., 284
CLEMENS, G. R., 438
CLINE, C. G., 437
CLODIUS, S., 1143
CLOUGH, F. H., 2010
COHEN, C., see DEAN, H. T.
COKER, R. E., 561
COLE, C. S., 821
COLLINS, L. F., 834
CONKLING, H., 1437
CONNOLLY, J. I., 1812
COOK, A. T., 1662 2026

COONEY, J. G., 1443 COOPER, S. R., AND TULANE, V. J., COREY, R. C., see FINNEGAN, T. J. CORNELL, G. M., see TURLEY, C. D. Connell, G. M., see Turley, C. D.
COUGHLAN, R. E., ET AL., 961
COUSINS, W. R., see Clark, L. M.
COVENTRY, F. L., SHELFORD, V. E.,
AND MILLER, L. F., 1820
COWLES, M. W., 284, 1439
CRAIG, C. F., 1432
CRANFORD, E. L., 1433
CRASU, V., AND MANOLE, V., 811
CRAWERD, C. M., 2016 CRASU, V., AND MANOLE, V., 811
CRAWFORD, C. M., 2016
CREPPS, R. B., 148
CROOK, G. M., 967
CROSS, H., 2012
CROSS, R. C., see DAMON, G. H.
CUNNINGHAM, J. W., 968
CUNNINGHAM, M. B., 1663
CUTTER, H. D., JR., 444
CUTTER, V. M., 157
CERNSNY, R. 2029 CZENSNY, R., 2029

DAMERELL, V. R., AND AXEBROD, M., 1160 DAMON, G. H., AND CROSS, R. C., 1444 DAMON, G. H., AND CROSS, R. C., 1444
DANNENBAUM, J. B., 969
DAPPERT, A. F., 676
DARSEY, V. M., 556
DAVIES, W. L., 822
DAVIS, C. F., 669
DAVIS, S. H., 963
DAWSON, F. M., 1813
see Kalinske, A. A.
DEAN, H. T., DIXON, R. M., AND
COHEN, C., 151 COHEN, C., 151 DE BEUS, J., see REITH, J. F. DEMMERING, W., see SPLITTGERBER, DENSHAM, A. B., AND SMITH, F. C., 153 DERBY, R. L., 554 DE SAINT-MARS, J., see Woog, P. DESCH, C. H., see LEA, F. M. DESCROIX, L., 1821
DISKINSON, M., 556
DIÉNERT, F., 2037
DIÉNERT, F., ÉTRILLARD, P., AND
LAMBERT, M., 1820
DIÉNERT F. GUILLERD A. ÉTRIL DIÉNERT, F., GUILLERD, A., ÉTRIL-LARD, P., AND WANDENBULCKE,

F., 2037

DIÉNERT, F., AND VILLEMAINE, F., 819

DISHNER, P. J., 563, 1663 DIXON, G. G., 280 Dixon, R. M., 970

Dodge, J. K., see Buchanan, E. B. Doland, J. J., 276

DONAHUE, T. F., AND ZIMBON, E., 560 DONOVAN, J. D., 273 DORE, S. M., 1435 DORFF, P., 566 DORFF, P., 566
DOUGLASS, A. H., 969
DOZOIS, K. P., HACHTEL, F., CARR, C. J., AND KRANTZ, J. C., JR., 824
DRAKE, C. F., 833
DRESHER, A. C., see YODER, J. D.
DUNLAP, A. H., 2017
DUROUDIER, R., 821

EATON, H. N., 2022 Eddy, G. E., 835 Eddy, J., and Rohrman, F. A., 1160 Edwards, A. M., 2011 EDWARDS, J. D., AND WRAY, R. I., 2027 EDWARDS, O. F., see MALLMANN, EHLERS, E. A., see PEARL, E. H. EHLERS, V. M., 969 EIFFERT, C. H., 425 EISENSTECKEN, F., 1143 EISENSTECKEN, F., AND GEROLD, E., 665 EISERT, W. L., 833 ELDRIDGE, E. F., 1823 ELDRIDGE, E. F., AND THEROUX, F. ELDRIDGE, E. F., AND THEROUX, F.
R., 1822
ELLIS, S. B., AND KIEHL, S. J., 671
ELLMS, J. W., 2033
EMDE, 2029
EMUNDS, A., 428
ENSLOW, L. H., 156
EPSTEIN, S. S., AND LEVINE, M., 1819
ESTY, R. W., 1814
ETHERIDGE, W., see KEY, A.
ETHILLARD, P., see DIÉNBET, F. ETRILLARD, P., see Diénert, F. Evans, S. A., Jr., 1666 Evans, U. R., 823 Ewing, S., 154, 1821 Eyre, T. T., 555

Faber, H. A., 1163
Fahlquist, F. E., 1435
Faust, R. G., 835
Feinberg, S., 814
Fenkell, G. H., 272
Fenwick, F., 670
Ferkinhoff, T. O., 1439
Ferris, C. A., see Hoskins, W. M.
Findlay, R. E., 444
Fink, G. J., and Lindsay, F. K., 2027
Finnegan, T. J., and Corey, R. C., 1147 1147 FINNEGAN, T. J., COREY, R. C., AND JACOBUS, D. B., 670 FIROVED, F. H., 566

FISCHER, M., see KRUSE, W. FISHER, L. M., AND ACKER, J. E., 957 FITCH, C. P., ET AL., 428 FITZGERALD, H., see MACKENZIE, G. M. FITZGERALD, R. W., 1815 FITZGERALD, P. D., 961 FLENTJE, M. E., 1163 FOLPMERS, T., 820
FOLTZ, A. V., 2032
FOSDICK, E. R., 436
FOSTER, M. D., 1446 FOSTER, R. N., see TURLEY, C. D. FOULK, C. W., AND BRILL, H. C., 557 FOWLER, H. D., 1662 Fox, C. S., 1833 FRANCKENSTEIN, W., 664 FREDERKING, A., 1157
FRENCH, D. K., 1147 FRESENIUS, L., 548, 550 FRICK, C., 963 FRICK, C., 903 FROBOESE, V., 427 FROMMES, M., 663 FUHRMAN, R., 970 FULKMAN, J. A., 1439 343 In S FULLER, J. E., see SYROCKI, A. V. FULTON, M., see CARPENTER, P. L. FULTON, W. H., 668 FURMAN, N. H., AND LOW, G. W., JR., 558

Gad, G., see Haase, L. W.
Gallagher, C. A., 1665
Gandeneerger, W., see Link, E.
Garmash, E. P., 550
Garner, J. H., 434
Garnock, A. R., and Hansen, P., 559
Garret, M., 665
Gascoigne, G. B., 970
Gazzi, V., 662, 1827
Gehm, H. W., see Rudolfs, W.
Genung, E. F., see Reed, M. V.
Germain, L., 1822
Gerold, E., see Eisenstecken, F.
Gerstein, A. H., see Gorman, A. E.
Gibson, J. E., 283
Gilcreas, F. W., 292
Gilkey, W. K., Rohs, H. L., and
Hansen, H. V., 1445
Gilkison, G. F., 970
Gillette, H. P., 281, 825
Girard, A., and Chaudron, G., 1657
Girard, R., 1149
Glaymann, J., 813
Goday, S. R., 429
Goldenberg, L., 1158
Goldfien, I., 276
Gol'dina, R. B., 1654
Goodale, L. A., 676
Goodwin, E. H., 970

Goodyer, P. J., 546
Gorman, A. E., Gerstein, A. H.,
And Peterman, P. H., 423
Gortner, R. A., 428
Gosline, J. E., see O'Brien, M. P.
Gottlieb, S., 1822
Gray, K., 1818
Greenfield, H. C., see Kowalchik, S. A.
Greenwood, D. A., see Ostrem, C. T.
see Kemp, C. A.
Grenoilleau, G., 1149
Griffin, A., 2025
Grime, E. M., 2026
see Turley, C. D.
Grimes, B. L., Jr., 829
Grimsley, J. T., 662
Grotts, P. E., see Thiessen, G.
Grünewald, M., 1822
Gubelmann, H., and Küenzi, W.,
818
Guillerd, A., see Diénert, F.
Guiteras, A. F., and Schmelkes,
F. C., 1655
Gumensky, D. B., 1829
Guntz, A. A., 660
Gurney, W. B., see Schwartz, M. C.
Gutschmidt, H., 1819

HAASE, L. W., 812, 971, 1143, 1144, 1152, 1159, 1657, 1823, 2030

HAASE, L. W., AND GAD, G., 442

HACHTEL, F., see DOZOIS, K. P.

HACKL, O., 547, 821 HAJNA, A. A., AND PERRY, C. A., 2014 HALL, G. A., 2034 HALL, G. L., 1830 HALL, R. E., 1816 HALLAND, H. R. F., 970 HALPIN, H. E., 675 HALVORSON, H. O., see ZIEGLER, N. R. HAMBLEN, A. D., see ANDERSON, G. W. HAMER, P., 825
see Clark, L. M.
HANAMAN, F., 1148
HANGOCK, A. P., 969 HANDORF, E. C., 1665 HANSEN, H. V., see GILKEY, W. K. HANSEN, P., 422, 559 HANSEN, P. A., see MARGOLENA, L. A. HANSEN-SCHMIDT, E., 1150 HARDING, J. C., 1438 HARDING, M. W., AND MOBERG, E. G., 1826 HARDING, S. T., 2036 HARDINGE, H., 671 HARDMAN, G., AND MILLER, M. R. 1146

HAROLD, C. H. H., 443 HARRINGTON, G. E., 565 HARRIS, J. P., 2017 Harrison, L. B., 834
Harrison, R. L., Jones, P. W., and
Shreve, R. N., 670
Harrold, L. L., 286
Harte, C. R., Jr., 1161
Hartung, H. O., 1665
Harza, L. F., 439
Hasbrouck, P. B., 561
Haupt, H., 971, 2029
Hawley, J. W., 951
Hawley, J. W., 951
Hawley, W. G., 832
Hazelhurst, G. H., 444
Hedges, C. C., 967
Heilmann, A., 971 HARRISON, L. B., 834 HEDGES, C. C., 967
HEILMANN, A., 971
HELGESON, H. G., 834
HELLER, K., KUHLA, G., AND MACHEK, F., 1159
HELLSTROM, B., 669
HEMEON, W. C. L., 559
HEMBELER, W. A. 1148 HEMMELER, A., 1148 HENRICI, A. T., AND JOHNSON, D. E. HERMANN, H., 1827 HERNDON, L. K., see CARPENTER, HERRING, J. E., 964 HERRMANN, A., 441 HETTCHE, H. O., 1816 HEUKELEKIAN, H., 817 HEUKELEKIAN, H., 817 HEY, R., 1156 HIBBS, A. S., 285 HICKS, W. F., 970 HILL, E. G., 558 HILL, N. S., JR., 285, 1813 HIXSON, A. W., 2028 HOAK, R. D., 833 HOARE, S. C., 953 HOARE, S. C., 953 HODGE, W. W., NI Hoare, S. C., 953
Hodge, W. W., Niehaus, E. J., 1163
Hodkinson, T., 288
Hofer, K., 813
Höll, K., 441, 1819
Holmes, E. L., see Adams, B. A.
Holton, P. K., Jr., 677
Holy, W. E., 1163
Hope, E., 1667
Hopkins, E. S., 565, 966, 1666
Horn, D. W., 1147
Horn, M., see Meinck, F.
Horwood, M. P., see Prescott, S. C. Horwood, M. P., see Prescott, S. C. Hoskins, H. A., see Price, P. H. Hoskins, J. K., 958, 1824
Hoskins, J. K., and Butterfield,
C. T., 818 Hoskins, W. M., and Ferris, C. A., 1160 HOUGH, L. C., see KILLAM, E. T. HOUSE, L. A., 1440

Houser, G. C., 291
Houston, H. L., 565
Houston, J. C., Jr., 1442
Hovey, O. E., 2036
Howard, C. D., 830
Howard, N. J., 286, 290, 832, 1830
Howard, P. F., 292, 965
Howland, W. E., 156
Howson, G. W., and Rees, R. L., 826
Howson, L. R., 965
Hoyt, J. C., 147, 1164, 2038
Hudson, H. E., Jr., 286
Hultin, C. T., see Mann, C. A.
Hunter, E., see Clark, L. M.
Hurdelbrink, F., 2029
Hurley, F. H., Jr., 1447
Hyde, C. G., 2010
Hyde, E. H., see Rhodes, E. O.

Ickes, H. L., 1812
Illarionov, V. V., see Revva, F. K.
Imbeaux, E., 2037
Imhoff, 2029
Iokhel'son, D. B., 1150
Irons, V., see Mackenzie, G. M.
Ittner, M. H., 671
Iyer, P. V. S., see Raghavachari, T. N. S.
Izgaruishev, N. A., and Smirnov, A. S., 545

Jacobus, D. B., see Finnegan, T. J. Jacques, A., see Leclercq, E. Jarvis, C. S., 564
Jewell, A. B., 159
Jewell, I. H., 280
Joachinoglu, G., and Klissiunis, N., 1653
Johnson, D. E., see Henrici, A. T. Johnson, R. P., 1832
Johnston, E. W., and Byram, A. T., 278
Jolles, B., 427
Jones, P. W., see Harrison, R. L. Jordan, H. E., 280, 282, 424, 444, 1436

Kaatz, L., and Richter, H. E., 547
Kaess, A., 667
Kahler, H. L., see Sheen, R. T.
Kalabina, M., and Rogovskaya, C., 426
Kalinske, A. A., Dawson, F. M., and King, F. R., 971
Karpov, A. V., and Templin, R. L., 437
Karsten, A., 660
Kauko, Y., 1824
Keeman, W., see Brender à Brandis, G. A.

KEEVIL, C. S., see SUMMERS, R. E.

Kellogg, W. H., 1155 Kellogg, W. H., 1155
Kelso, G. L., 1163
Kemp, C. A., Greenwood, D. A.,
And Nelson, V. E., 1827
Kennison, K. R., 951
Kershaw, N., see Boatman, L.
Key, A., and Etheridge, W., 1150
Keyes, D. B., 548
Kiehl, S. J., see Ellis, S. B.
Kielland, J. 822 KIELLAND, J., 828 KILLAM, E. T., ET AL., 674 KING, F. R., 2010 see Kalinske, A. A. KING, M. R., 957 KLEIN, A., see QUAM, G. N. KLISSIUNIS, N., see JOACHIMOGLU, G. KNAYSI, G., 824 KNIGHT, O. A., 664 KOJINOR, V. E., 953 KOLTHOFF, I. M., 2026 KOOYMANS, L. H. L., AND WIEGAND, KOSCHKIN, M. L., AND WIEGAND, J. A., 427 KOPPEL, P., 1828 KORERMAN, I. M., 821 KOSCHKIN, M. L., 441, 551 KOSCHKIN, M. L., AND SPEKTOR, E. M., 1156 KOSTRIKIN, Y. M., 666 KOSTRIKIN, Y. M., AND PROKHOROV, F. E., 661 KOWALCHIK, S. A., AND GREENFIELD, H. C., 830 KRAMER, S. P., 1657 Krantz, J. C., Jr., see Dozois, K. P. Krasten, P., 826 Krauze, S., 1822 KREUZ, 971 KRISHNASWAMI, K. R., see SUNA-WALA, S. D. KROSE, W., AND FISCHER, M., 551, 2016 KRYSTOF, J., see BABLIK, H. KÜENZI, W., see GUBELMANN, H. KÜHL, H., PARGA-PONDAL, J., AND BAENTSCH, S., 549 Kuhla, G., see Heller, K. Kuhn, R. J., 816 Kuisel, H. F., 1825 Kuranz, A. P., 273, 561

LA DUE, W. R., 1440 LAFUMA, H., 662 LALLY, T. E., 677 LAMBERT, M., see DIÉNERT, F. LANDER, G. D., 1823 LANE, E. W., 439 LANE, E. W., AND BINGHAM, W. F., 276

KUSHLYANSKII, N. E., 666

LANGLEY, F. F., 293 LANGUET, 8: F., 255 LANGUET, 8: ARMAND LARIAN, M. G., AND MANN, C. A., 1161 LATHROP, T. R., 2033 LAUER, B. E., see Mann, C. A. LAUGHLIN, G., 966 LAWRENCE, E. A., 2011 LAWRENCE, W. C., 2032 LEA, F. M., AND DESCH, C. H., 1833 LECHNER, E., 1825 LECLERCO, E., AND JACQUES, A., 1654 LEDERER, H., 817 LEE, C. H., 554 LEE, R. E., 829 LEEDOM, R., 144 LEGGETTE, R. M., see TAYLOR, G. H. LEHMANN, H., 679 LEHMKUHL, H. W., 427 LEICK, J., see LIST, L. LEIFSON, E., 2014 LEISEN, T. A., 290 LEJEUNE, G., 1652 LEMARCHANDS, M., AND LE VIET, K., 1818 LEMARCHANDS, M., AND SAUNIER, D., 812 LEROUX, L., 431, 1654, 1656 LESCOEUR, see ARMAND LE VIET, K., see LEMARCHANDS, M. LEVINE, M., see CHARLTON, D. B. see Epstein, S. S. LEWIS, L. L., 1815 LEWIS, P. S., see ROBSON, S. LIANDER, H., 663 LIDICKER, W. Z., 2013 LIECK, J., 678 LINDNER, E., 2014 LINDSAY, F. K., see FINK, G. J. LINK, E., AND GANDENBERGER, W., 2029

LLOYD, B., 1827 LOFTUS, F., 557 LOGAN, K. H., AND TAYLOR, R. H., 664 LOVEJOY, W. H., 280 LOW, G. W., Jr., see Furman, N. H. LURIE, M., AND MICHAILOFF, N., 1445 LYKINS, J. D., see OLIN, H. L. LYMAN, F. E., 834

LIST, L., AND LEICK, J., 428

MABEE, W. C., 273 MACHEK, F., see HELLER, K. MACKENZIE, G. M., FITZGERALD, H., AND IRONS, V., 672 MACKEY, G., 1826 MACONACHIE, J. E., 426 Мане, R., 1823 Маные, W. S., 967

MAHNCKE, H. E., see RAKESTRAW, N. W. MALLMANN, W. L., AND EDWARDS O. F., 1655 MALONE, J. J., 962
MANN, C. A., see LARIAN, M. G.
MANN, C. A., LAUER, B. E., AND
HULTIN, C. T., 1161
MANOLE, V., see CRASU, V. MARGOLENA, L. A., AND HANSEN, MARGOLENA, L. A., AND HANSI
P. A., 665
MARQUIS, J. K., see SIMMS, R. B.
MARSHALL, L. A., 2036
MARSTON, F. A., 1438
MARTIN, A. J., 2037
MARTINY, M. J., 1655
MARTINY, 428
MASSINK A. AND BALO BERNEY MASSINK, A., AND BA.
L. G. M., 1652
MATHEWS, W. W., 444
MATTERN, E., 1145
MATTHEWS, F. J., 2037
MATTHEWS, W. W., 2025
MAXWELL, D. H., 272
MCADAMS, E. E., 968 AND BAAS-BECKING, McAdams, E. E., 968 McAfee, H. D., 970 McClendon, W. W., 969 McComas, J. R., 565 McConaughy, D. C., 286 McCord, C. M., 825 McCorkle, I. B., see Speller, F. N. McCue, J. B., see Price, P. H. McCurdy, H., 555 McCURDY, H., 595
McGONEGAL, A. R., 566
McKAY, W. D., 1444
McLAUGHLIN, P. L., 1163
McMURRAY, C. A., 151, 968
McNAMEE, P. D., 556
McQUEEN, H. S., 970
MEAD, D. W., 1433
MEAD, H. W., 2012
MEINCK, F. AND HORN, M. MEINCK, F., AND HORN, M., 1152 MEINZER, O. E., 278 MEITINA, V. N., see NIKIFOROV, E. A. Mendelsohn, I. W., 154, 964 MEYER, A. F., AND VAN ROSSEN, A., 426 Michalloff, N., see Lurie, M. Michel, L. P., 549 Michelucci, A., and Nalini, G. B., 817 MIEDER, F., AND VIEHL, K., 2028 MIKHALCHISHIN, G. T., 550 MILLER, H. E., see MILLER, K. E. MILLER, J. T., AND BYERS, H. G., 1159 MILLER, K. E., AND MILLER, H. E., MILLER, L. F., see COVENTRY, F. L.

MILLER, M. R., see HARDMAN, G.
MILLER, T. C., 970
MINDER, L., 2015
MINDER, L., 2015
MINDETT, F. C., WOOLDRIDGE, G. H.,
AND SHEATHER, A. L., 1823
MOBERG, E. G., see HARDING, M. W.
MOGG, T. E., 661
MOISSEEV, S. V., AND GILLER, N. S.,
1816
MOLNAR, D., 822
MONONOBE, N., 1435
MONTGOMERY, J., 967
MOONEY, G., AND WINSLOW, C.-E.
A., 2014
MOORE, E. M., 1432
MOROZOVA, A. I., see TAGEEVA, N. V.
MORSE, R. B., 565
MOSES, H. E., 1154
MOSS, N. V., 2010, 2016
MOWRY, C. W., 157
MUDGE, C. S., AND SMITH, F. R., 822
MÜLLER, B., 1145
MÜLLER, H., see WEYRAUCH, F.
MUNOS, J. M., 1820
MUNRO, W. P., see OLIN, H. L.
MUNROE, W. C., 565
MURPHY, F. M., 968, 2016

Nachtigall, G., and Schröder, H., 2030

Nagatkin, I. T., see Voznesenskii, S. A., S. A., see Yarnell, D. L. Nalini, G. B., see Michelucci, A. Naumann, 1143

Naumann, E., 823, 2030

Naumann, E. and K., 427

Naumann, E. and K., 427

Naumann, K., see Naumann, E. Nelson, H. L., 959

Nelson, V. E., see Ostrem, C. T. see Kemp, C. A.

Nemeth, D. J., 1146

Nichols, M. C., 2017

Nichols, M. C., 2017

Nichols, M. L., and Willits, C. O., 667

Nickle, H. G., 970

Niehaus, E. J., see Hodge, W. W.

Nikiforov, E. A., 666

Nikiforov, E. A., 666

Nikiforov, E. A., and Meitina, V. N., 1815

Nix, R. F., 969

Noland, T. J., Jr., 1149

Nunn, H. E., 440, 964

Nussbaumer, N. L., 279

O'BRIEN, M. P., AND GOSLINE, J. E., 557 OESTING, R. B., 1656 OLD, H. N., 444 OLIN, H. L., LYKINS, J. D., AND MUNRO, W. P., 559 O'NEALE, M. L., 1163

OSTREM, C. T., 1657
OSTREM, C. T., GREENWOOD, D. A.,
WILLHELM, H. A., AND NELSON, V. E., 1820

OVCHINNIKOVA, Y. S., see SKOPINT-ZEV., B. A.

Pabst, see Bruns, H. Painter, J. H., 970

PALMER, H. K., 156 PALMER, H. K., AND BOWLUS, F. D.,

PARGA-PONDAL, J., see KÜHL, H.

PARKER, A., 433 PARKER, L. T., 281, 282, 561, 562, 673,

PARKER, L. T., 281, 282, 301, 302, 073, 952, 954, 955, 960, 1659, 1660, 1662, 1663, 1664

PARKS, W. J., Jr., 1665

PARTANSKY, A. M., see BENSON, H. K. PARTRIDGE, E. P., AND SCHROEDER, W. C., 1829

PAYNE, C. R., 963

PEARL, F. H., AND EHLERS, E. A., 829

PATNE, C. R., 963
PEARL, E. H., AND EHLERS, E. A., 829
PEIRSON, A. G., 424
PENDLETON, T. P., 147
PERKINS, C. E., 2017
PERRY, C. A., see HAJNA, A. A.
PETERMAN, P. H., see GORMAN, A. E.
PEUGH, V. L., 553
PEYROT, E., 815
PETERERE 822

Preiffer, 822 Phelps, E. B., 1658

PHILIPPE, R. R., 1433

PICARD, Ř., 1820 PIRIK, H., AND WENZEL, W., 668 PIRNIE, M., 678

PIWOWARSKY, E., 1143, 2030 POCHINOK, K. N., 819

POLLAK, L., 814 PORTEOUS, P., see SUCKLING, E.

PORTEVIN, A., 813 POSEY, C. J., 275

POSEY, C. J., 275
POTTER, J. M., 155
POWELL, S. T., 669
POWELL, W. H., 146
POWERS, T. C., 670
POWERS, T. J., 835
PRATT, J. H., 1654
PRESCOTT, S. C., AND HORWOOD, M.
P 1822 P., 1833

PRICA, M., 1819
PRICE, P. H., McCue, J. B., Hoskins,
H. A., 1164
PRIOR, J. C., 835

PROBST, E., 2017 PROKHOROV, F. E., see KOSTRIKIN, Pugh, L. P., 1823 Purdy, W. C., 2034 PUTNAM, G. L., see ROBINSON, R. J.

QUAM, G. N., AND KLEIN, A., 2012 QUINLAN, J. B., 1440

RAADSVELD, W., 1144, 1657
RADMAN, L. W., 2032
RAGHAVACHARI, T. N. S., 948
RAGHAVACHARI, T. N. S., AND IYER,
P. V. S., 434, 948, 949
RAKESTRAW, N. W., AND MAHNCKE,
H. E., 556
RAKESTRAW, N. W. MAHNCKE, H. E.

RAKESTRAW, N. W., MAHNCKE, H. E., AND BEACH, E. F., 1445

AND BEACH, E. F., 1445
RAPP, W. M., 281, 963
RATLIFF, R. C., 970
REBBAMEN, L. M., 159
REDDITT, J. S., 969
REED, M. V., AND GENUNG, E. F.,

1150

1150
REES, R. L., see Howson, G. W.
REICHELT, H., 1817
REINKE, E. H., 970
REITH, J. F., AND DE BEUS, J., 1144
REMY, E., 1157
RESTLER, J. D., 951

RETOVSKY, R., 1824 REVVA, F. K., AND ILLARIONOV, V. V., 664

RHODES, E. O., AND HYDE, E. H., 558

RICCI, J. E., 1444 RICE, C. W., 1148 RICH, A. D., see BLANNING, H. K. RICH, T., 1818, 2022 RICHTER, H. E., 667

see KAATZ, L.

866 KAATZ, L.
RIEMER, H., 1158
RIPPLE, O. J., 281
RITSCHEL, O., 2015
ROBERTS, F. C., JR., 832, 1154, 1155
ROBERTSON, E. C., 1832

ROBEY, O. L., 970 ROBINSON, D. W., 969 ROBINSON, R. J., AND PUTNAM, G. L.,

ROBSON, S., AND LEWIS, P. S., 429
ROE, F. C., 970
ROGERS, C. F., see FITCH, C. P.
ROGERS, R. R., 671
ROGERS, W. F., 425
ROGOVSKAYA, C., see KALABINA, M.
ROHRMAN, F. A., see SEEBER, R. R.
see EDDY, J. see Eddy, J.

ROHS, H. L., see GILKEY, W. K. ROLLINS, F. L., 2034 ROSS, A. A., 154, 292

Rowe, E. A., 149

ROWLEE, B., 952
ROWLEY, A. M., 1821
RUCHHOFT, C. C., 1816
RUCKMAN, C. L., 279
RUDGAL, H. T., 955
RUDOLFS, W., AND GEHM, H. W., 1162
RUSELL, F., 961
RYON, H., 964

J.

R,

SAFRANEZ, K., 1822 SANDER, F., 1158 SANDER, P., 1158 SANSBURY, W. E., see BARTOW, E. SARTORIUS, F., AND WEVER, G., 442 SARTORIUS, F., AND WEVER, G., 442
SAUNIER, D., see LEMARCHANDS, M.
SAVILLE, C. M., 283
SAVVATEEV, A. L., 1819
SCHERINGA, K., 426
SCHILLINGER, A., 971
SCHIOPPA, L., 663
SCHMELKES, F. C., 552
see GUITTERAS A. F. see Guiteras, A. F. Schmid, T., Jr., 811
Schneider, W. R., 813 SCHOEN, R., 551
SCHOEPFLE, O. F., 2032
SCHONNOPP, G., 971
SCHOONMAKER, G. N., 284
SCHOONBER H. Schröder, H., see Nachtigall, G. Schroeder, W. C., see Partridge, E. P. SCHULTZE, K., 1818, 1822

Schumann, L., 429 Schwada, J. P., 272 Schwartz, M. C., 2037 Schwartz, M. C., and Gurney, W. B., 661

Scobey, F. C., 555 Scolfield, C. S., 662 Scorer, S. D., 1152 Scott, G. N., 815 SCOTT, G. S., see TURNER, H. G.

Scott, G. S., see Takelin, it is Scott, L. H., 159
Scott, R. D., 278, 965, 2035
Scott, W. J., 676, 829, 1155
Scouller, W. D., and Watson, W., 1147 SEAL, B. C., 1830 SEARS, W. H., 291 SEEBER, R. R., ROHRMAN, F. A., AND

SMEDBURG, G. E., 816 B, E., 2031 SEYB, E., 2031

SHANK, J. R., 669 SHEATHER, A. L., see MINETT, F. C. SHEEN, R. T., AND KAHLER, H. L., 1444

SHELFORD, V. E., see COVENTRY, F. L. Shepperd, F., 284, 1813

SHERMAN, C. W., see KILLAM, E. T. SHOEMAKER, M. J., 552 SHPAK, M. A., AND SHUBAEV, 1828 SHREVE, R. N., see HARRISON, R. L. SHUBAEV, see SHPAR, M. A. SHUNK, I. V., 1656 SIBELIUS, H., 1827 SIELING, D. H., see CLARK, N. A.
SIERP, F., AND BRUNS, H., 545
SIGWALT, R., see Woog, P.
SILCOX, H. E., ET AL., 962
SIMMS, R. B., AND MARQUIS, J. K., 962

SIMPSON, E. S., 820
SIMPSON, E. S., 820
SINGLETON, W., 1148
SKOPINTZEV, B. A., AND OVCHINNIKOVA, Y. S., 819
SLADE, J. J., 1432
SLESSAREV, M. N., 1661
SMEDBURG, G. E. 262 STERRED, D. D.

SMEDBURG, G. E., see SEEBER, R. R. SMELLIE, J., 950 SMIRNOV, A. S., see IZGARUISHEV,

N.A. SMITH, E. A., 964, 1148, 1818 SMITH, F. C., see DENSHAM, A. B. SMITH, F. R., see MUDGE, C. S. SMITH, H. M., see ANDERSON, G. W. SMITH, M., 277

SMITH, O. M., AND BLAIR, H., 823 SOCHILOVA, A., see BARSOV, K. SOLBERG, T. A., AND ADAMS, R. C.,

JR., 811 SOUTHGATE, B. A., 1817
SPEKTOR, E. M., see KOSCHKIN, M. L.
SPELLER, F. N., AND McCORKLE,
I. B., 815
SPENCER S. D. 270

SPENCER, S. R., 279 SPLITTGERBER, A., AND DEMMERING,

W., 2029 W., 2029
STABLEFORTH, A. W., 1823
STANLEY, W. S., 970
STAPLEY, E. R., 151, 159, 441
STAUB, W. S., 673
STEEL, E. W., 1664
STEELE, E. W., AND ZELLAR, P. J. A.

970 STEGEMAN, P., 834, 953 STENZEL, R. W., 2027 STEPHAN, H., 1656 STEWARD, F. L., 970

STENZEL, R. W., 2021 STEPHAN, H., 1656 STEWARD, F. L., 970 STEWART, A. W., 2037 STEWART, W. C., 565 STOOF, H., 1143, 2028, 2030 STRAUB, F. G., 556, 811, 816, 1160 STRAUB, J., 552

STRAUB, L. G., 1437 STREANDER, P. B., 560 STREET, A. L. H., 1438 STREETER, H. W., 424, 429, 662 STREITHOF, C., 964

STUART, C. A., 866 CARPENTER, P. L. see Anderson, E. H. STUART, F. E., 150, 289, 444, 1163 STUMPER, R., 2031 STYER, C. A., 1152 SUCKLING, E., AND PORTEOUS, P., 827 SULLIVAN, E. J., 293 SULLIVAN, W. F., 292 SUMMERS, R. E., AND KEEVIL, C. S., 817 SUNAWALA, S. D., AND KRISHNA-SWAMI, K. R., 1824 SURAN, L., 2031 SWART, R. E., 674 SWYTER, 1146 SYROCKI, A. V., AND FULLER, J. E., 824 SZEGÖ, L., AND CASSONI, B., 663 TABAKOFF, V., 427 TAGEEVA, N. V., TZEĬTLIN, S. G., AND MOROZOVA, A. I., 1153 Tauson, A. O., 1828 TAYLOR, A. C., 550
TAYLOR, E. L., 676
TAYLOR, F. S., 2035
TAYLOR, G. H., AND LEGGETTE, R.
M., 2025
TAYLOR, P. M. TAYLOR, R. H., see LOGAN, K. H. TAYLOR, S. H., 292 TAYLOR, T. U., 967 TAYLOR, T. U., 907
TEMPLIN, R. L., see KARPOV, A. V.
THAYER, S., 664
THEROUX, F. R., see ELDRIDGE, E. F.
THIELE, H., 1152, 1157
THIESSEN, G., BALL, C. G., AND
GROTTS, P. E., 1445

TRELLES, R. A., 1002
TRICE, M. F., 2011
TULANE, V. J., see COOPER, S. R.
TUPHOLME, C. H. S., 1160, 2028
TURLEY, C. D., CORNELL, G. M.,
GRIME, E. M., AND FOSTER, R. N., 2026 TURNER, H. G., 1152 TURNER, H. G., AND SCOTT, G. S., 963, 1149 TURNER, M., 2017

THORN, F. C., 1161 THOROGOOD, A. L., see BARR, G.

TILDEN, J. E., see FITCH, C. P. TIMANUS, C. S., 283 TISDALE, E. S., 1164

THOMPSON, E., 827

THUMA, R. A., 562

Торт, F., 1142

TOTOIESCU, D., 663 TOWSE, H. R., 1815 TRACY, E. L., 275 TRAXLER, R. N., 1446 TRELLES, R. A., 1652

TURNER, W. D., 432, 1152 TUTTLE, F. E., 1447 TUTUNDZICC, P. S., 1653 TWEEDLE, C. E., 969 TYLER, P. M., 545 TZEITLIN, S. G., see TAGEEVA, N. V.

ULLYOTT, P., 828 ULRICH, C. J., 277 ULRICH, F. P., 2020 ULSAMER, O., 2014 URBACH, C., 668, 1146, 1149 USATENKO, Y. I., 1820

VAGTBORG, H., 953 VAIL, D. M., 1442 VAIL, J. G., 1445 VAN ARNUM, W. I., 2035 VANCE, A. M., 969 VAN DEN BERG, C., JR., 1164 VAN DER LEEDEN, R., 971 VAN DER MEULEN, J. H., 1653 VAN ROSSEN, A., see MEYER, A. F. VASIL'EV, A. M., AND VASIL'EVA, L. A., 1827 VASIL'EVA, E. V., 550 VASIL'EVA, L. A., see VASIL'EV, A. M. VAUGHN, W. H., 151, 159 VEATCH, N. T., Jr., 285 VELZ, C. J., 1150 VERMILYE, S., 444 VERTES P 1820 VERTES, P., 1829 VIEHL, K., see MIEDER, F. VILLEMAINE, F., see DIÉNERT, F. VOLLMAR, O., 826, 1656 VON GEMMINGEN, V., 155 Voss, W. C., 670 VOZNESENSKII, S. A., AND NAGATKIN, I. T., 549 VROOMAN, M., JR., 1438, 1660 VUILLEMIN, R., see ACKLIN, O.

WADDINGTON, A. H., 828 WAGNER, C. L., see ABRAMS, A. WANDENBULKE, F., see DIÉNERT, F. WARD, H. A., 823 WARDLOW, B., 967
WASHA, G. W., 1826
WATSON, W., see SCOULLER, W. D.
WECKEL, K. G., see BECK, H. H. WEIGMANN, A., 971 WEISE, E., 971 WELCH, P., 1444 Wellington, M. S., 281 Wells, J. P., 282, 284 WENZEL, W., see PIRIK, H. WESLEY, J. B., ET AL., 962 WESTERBERG, G., 546 WESTON, A. D., 158, 951 WESTON, R. S., 157, 834 Wever, G., see Sartorius, F.
Weyrauch, F., and Müller, H., 442
White, E. H., 551
White, L. P., 440
Whitman, N. D., 554
Wichers, C. M., 563, 664, 815
Wiegand, G., 1142, 2030
Wiegand, J. A., see Kooymans,
L. H. L.
Wieninger, F. M., 818
Wiggin, T. H., 291, 834
Wigmore, R. W., 158
Wilbur, E. M., 2018
Willberg, B., 1823
Willberg, B., 1823
Willhelm, H. A., see Ostrem, C. T.
Williams, K. T., and Byers, H. G., 556
Willits, C. O., see Nichols, M. L.
see Clark, A. W.
Wilson, P. S., 280
Wilson, W. J., 1151
Winder, J. E., 152
Wing, H. J., 1444
Winkler, L. W., 814
Winslow, C.-E. A., see Mooney, G.
Winsor, F. E., 1435
Wolfe, E. E., 970

Wolman, A., 956, 959, 1667
Wolpert, N. N., 282, 954, 1812
Wood, G. B., 557
Woodbon, J. T., 1439
Woog, P., Sigwalt, R., and de Saint-Mars, J., 812
Wooldridge, G. H., see Minett, F. C.
Wooten, J. S., 968
Wray, R. I., see Edwards, J. D.
Wrightington, S. R., 292
Wyatt, J., 968
Yarovley, A. V., 1818

YAROVLEY, A. V., 1818
YARNELL, D. L., AND NAGLER, F. A.,
438
YAXLEY, R. G., 291
YODER, J. D., AND DRESHER, A. C.,
1147
YOUNG, W. R., 2022

Zellar, P. J. A., see Steele, E. W. Ziegler, N. R., and Halvorson, H. O., 672
Zimbon, E., see Donahue, T. F. Zimmerman, P. W., and Berg, R. O., 814

## INDEX TO ABSTRACTS

## II. SUBJECTS

Aberdeen, S. D.; new supply system and treatment plant, 952, 2025 Willow Creek Dam, 2025 Accounting, customer; 829, 2016

see Billing

Acid-base equilibria; 2027

Acidity; see Hydrogen-ion concentration

Acidity, correction; aeration and, 822, 1143

lime and, 1143

magno-masse, filtration through, 1143, 2016, 2030

marble, filtration through, 1143 sodium carbonate and hydroxide and, 1143

Administration; commission and, 279 Advertisement; exhibit and, 673 Aeration; 962, 1155, 1439, 1443, 1655

Aer-O-Mix and, 1668 compressed air and, 1661 double, 677

history, 1434

spray nozzles and, 1442, 1444, 1656 trays and, 149

see Acidity, correction; Carbon dioxide removal; Coagulation; Corrosiveness; Hydrogen sulfide removal; Iron removal; Odor; Oxygen dissolved; Taste and odor

Aer-O-Mix; 279 see Aeration

Air conditioning; cross connections and, 566

water consumption and, 439, 566, 954, 958, 1142, 1815, 2038 Air-lift; see Bubble

Akron, O.; algae, tastes and short filter runs and, 2035 cross connections, control, 2033 water supply, fire protection and,

1440 Alabama; water supply supervision,

Algae; see Microscopic organisms Alkali; determination, spectrographic, 1825

industry, in America, 558 removal, synthetic resins and, 430

see Potassium; Sodium

Alkalinity; see Carbon dioxide; Hydrogen-ion concentration; Lead Alkalinity determination; 546, 547

carbonate and bicarbonate, photoelectric, 1825

hydroxide, in boiler water, accuracy, 817

All-American Canal; see United States Bureau of Reclamation Alla Sella Zerbino Dam; failure, 2017

Alpena, Mich.; filters, rehabilitation, 834

Altona; cholera epidemic, 1143 Alum; carbon-containing, 434 conveyor, pneumatic, 288

see Coagulation; Color removal; Fluorine; Iron removal; Manganese removal; Softening; Swimming pool

Alumina; colle Jal, bactericidal ac-

tion, 1819 see Fluorine

Aluminum; determination; 662, 819 hematoxylin and, 1828 permissible concentration, 678 protective coating formation, 1152 see Pipe joint

Aluminum Company of America; Calderwood Dam, model study, 437 Amarillo, Tex.; customer accounting,

2016 meter reading and billing, 2010 mottled tooth enamel, 151

Amebiasis; see Dysentery; Endameba American Gas Association; pipe lines, cathodic protection, committee report, 154

American Society of Sanitary Engineering; annual meeting, 30th, 957 hotel plumbing and conventions, resolution re, 958 American Water Works Association;

Recovery Program and, 444 see Committee reports; Southeastern Section

Amines; see Odor

Ammonia; determination, 823 see Chlorination; Cylinder; Insect; Taste and odor

Ammonia, albuminoid; phenol and,

parallel changes, 820 see Swimming pool Ammonia, free; see Nesslerization Ammonium salts; removal, synthetic resins and, 430 Ammonium sulfate; dry feed, 423 Ammonoosuc River; pollution, 830 Anabaena; chlorination and, 1828 lime softening and, 2035 taste and, 2035 Analcite; composition, 1160 see Boiler scale

Annapolis, Md.; incinerator, 565 Anthranol; solubility, 429 Aphanizomenon; chlorine and, 1828 Aquarium; sea water, purification and re-use, 144

storage reservoir, hard rubber piping and fiber pumps, 144

Aqueduct; rock excavation and cost, 1435 see Conduit; Pipe; Siphon; Tunnel; etc.

ground water pollution, Arizona; cess pools and, 832 mottled enamel, fluorine teeth,

and, 282

water supplies, hardness, 1154 Arkansas; ground waters of, 159 Water and Sewage Conference, 159 Army; water supplies, filter, 665 Arsenic; lethal dose, 1159

Artesian; origin of term, 674 see Well

Asheville, N. C.; chloramine treatment, 1665

Factory Mutual Fire Associated Insurance Co.; main and hydrant thawing instructions, 144

Asterionella; odor and, concentration and, 2034 taste and odor and, 2035

Atlanta, Ga.; consumption in apart-

ment houses, 963 water cooling, 281 Atlantic Coast Line Railroad; feed-

water treatment, 280

Aurora, Ill.; water works and ele-vated storage, 1436

Austin, Tex.; services, 2017 Avon Lake, O.; intake, low water level and, 2031

Azochloramid; bactericidal action, chlorine absorption by organic

matter, rate, pH and, 1655

Bacteria; count, standard vs. flooded plate, 824 dissociation, 672

dyes, bacteriostatic action, 1150 identification in water, concentration by adsorption on alumina and, 1820

limit for swimming pools, 1656, 2015 stalked, 672

storage and, 828 Bacteriological examination: Filtration, rapid sand; Steriliza-

tion; etc. Bacteria, colon group; differentiation; citrate and indole tests; correlation, 949

methyl red test and, correlation, 1149

intermediate strains, tests, comparison, 824 methylene blue reduction and.

948

neutral red reaction; 948 oxidation-reduction potential and, 545

tests, correlation, 833 value in water analysis, 949, 1821

dulcitol and mannitol and, 824 longevity in activated sludge, 1817 metabolic activity at different phases of culture cycle, 2014

significance, sanitary, 833

see Bacteria, lactose-fermenting; Bacterium aerogenes; Bacterium coli; Voges-Proskauer test

Bacteria, iron; 566, 2015 culture, 566

see Crenothrix Bacteria. lactose-fermenting: water of tropics, 1826 see Bacteria, colon group

Bacteria, manganese; 566 Bacteria, spore-forming; chlorine and, 434

Bacteriological examination; 968, 1163

agar plates, pouring, apparatus for, 2014

bacteriophage, interference and, 551

interpretation, 159

samples, collection and transportation, 1152

see Bacteria; Bacteria, colon group; Bacterium coli test; Bacterium paratyphosum; Bacterium typhosum; Petri dish

Bacteriology; see Books

Bacteriophage; bacteriological tests, interference and, 551

purification, natural, and, 551 Bacterium aerogenes; acid production, 824

death rate, 1821 growth, methyl germanium oxide and, 672 in sewage and feces, 1821 significance in water, 949, 1821 see Bacteria, colon group

Bacterium coli; acid production, 824 brilliant green, inhibitory action,

colloidal silica, ferric hydroxide and alumina and, 1819 dead and living cells, distinguish-

ing, 824 decrease, natural, humic matter and, 442

Endo medium, reaction, nature of,

glucose fermentation, buffering and, 668

growth, methyl germanium oxide and, 672

Katadyn and, 441, 1820 limit for swimming pools, 1656,

2015 neutral red and, 824

Ohio filter plant statistics, 2033 silver and, 1653

ultra-violet ray and, 1827 see Bacteria, colon group; Purification, self

Bacterium coli test; 970 confirmation; 1157

brilliant green bile vs. standard method, 835

citrate agar, 1149 neutral red bile salt agar, 949

dilution method, plate and direct counts, comparison, 672 Eijkman test, 950, 1157 extraneous forms and, 833 literature review, 949

Minkevitsch milk medium, 1145 nitrocellulose filter and modified Endo medium, 1153

plating, direct; brilliant green bile salt agar, 833

ferrocyanide-citrate agar, 833 lactose-fuchsin-gelatin, 1157 presumptive; bottle for, 1157

brilliant green bile, 833, 1656 Bulir neutral red mannite broth, 1156

crystal and gentian violet broth, 833, 1657 Dominick-Lauter medium, 833

fuchsin broth, 833, 1657 glucose broth, 1156 lactose broth; 1656

comparison with brilliant green bile, MacConkey's bile and crystal violet

broth, 949 MacConkey's h bile; Dominick-Lauter medium and, comparison, 950

formula, 950

sewage, comparison of Eijkman test, lactose broth, buffered lactose broth and Ritter, Salle, Dominick-Lauter, Stark and England broths, 2014

standard; Prussian, 1156 of various countries, 949 see Bacteria, colon group; Bacteri-

ological examination Bacterium mesentericus; Katadyn

and, 441 Bacterium paratyphosum; isolation.

neutral red reaction and, 545

Bacterium subtilis; Katadyn and. 441

Bacterium typhosum; decrease, natural, humic matter and, 442 growth, methyl germanium oxide and, 672

isolation: 1151

study recommended, 959 longevity in activated sludge, 1816

in sewage, 959, 1151 Baltimore, Md.; emergency repairs, 1812

microörganisms, 565 Moore's Run interceptor, 566 services, thawing, 1812

Barberton, O.; algae problems, 2034 reservoir, dredging, 2032 Barium aluminate; see Softening

Barium carbonate; see Softening Barium hydroxide; see Softening Base exchange; equilibria, thermo-

dynamics of, 828 in geological structures and soils, 662

see Softening

Bathing beach; chlorination and, 959 pollution study, 959

see Swimming pool Beautification; see Water works Berlin, Germany; consumption, 1145 corrosion problems, 2030

impounding reservoirs, proposed, 1145

manganese removal, 1146 sewage irrigation, 971

Bermuda; rainfall, 432 water supply and treatment, 432, 1152

Switzerland; Bern, chlorination taste, 818

Beverly, Mass.; new purification plant, 1438 Bicarbonate determination; see Alkalinity Bile: see Bacterium coli test Billing; 444, 829, 2010 bill; as lien, 955 tenant's responsibility, 561 collection for water wasted wrongfully taken, 1438 delinquents and; 829, 970 collection, commission basis, 1440 payment by work, 1440 improvements, 1813 practice, 1440, 1442, 1444 see Accounting Bills Brook Dam: see Hartford, Conn. Bin: see Chemical Birm; see Iron removal Birmingham, Ala.; new industrial water supply system, 1443 Bleaching clay; see Clay, bleaching Bleaching powder; see Calcium hypochlorite Boiler; collapse, low main pressure and, liability and, 292 Magnaflux cracks, detecting, method, 1816 safety plugs, failure, causes, 1821 Heating system; Railroad; Steam plant Boiler compound; Navy formula, 811 Boiler corrosion: 814 embrittlement, 1829 graphite and, 545 hydrogen-ion concentration and, hydrogen sulfide production from calcium sulfate and, 661 oil and, 1148 oxygen and, 813 permutite treatment and, 545 pitting, 1152 prevention; 813 alkali and, 441 oxygen removal and; 441 thiosulfate and, 1816 phosphate and, 661 sodium hydroxide and, 661 see Heating system; Railroad Boiler feed water; calcium and magnesium determination, micro, 1658 line, scale prevention, 1816 municipal treated supplies and, 834 oxygen determination; 1147, 1816 recorder, 1816 in sulfite-deaerated, 1654

treatment: deaeration, 1827

degasification, 2031

dejector system, 1157

lime-soda, sodium aluminate and. softening: 1152, 1827 base exchange; hydrogen permutite and, 662 lime prior to, 666 trisodium phosphate, Budenheim process, 1828 see Books; Railroad Boiler foaming; see Railroad Boiler furnace; ash handling, mechanical equipment, 1813 stokers, automatic, 1813 Boiler priming; calcium carbonate and magnesium hydroxide and, 557 Boiler scale: calcium sulfate: 1152 formation, rate, 817 hydrogen sulfide production, corrosion and, 661 prevention; carbonate-sulfate ratio and, 811, 816 phosphate and, 661 soda ash and, 548, 661, 817 formation; 669 theory, 1818 fuel consumption and, 1152, 1818 identification, petrographic, 669 prevention; 1818 carbonate-sulfate ratio and, 1828 phosphate and, 1158 scale-buoy system, 286 soda ash and, 1158 removal, trisodium phosphate and, 1822, 1829 silica: 1152 analcite scale, prevention and, 1160 phosphate and, 817, 1148 sand vs. coal filtration and, 1149 soda softening, as result of, 428 sodium aluminum silicate, 1816 Boiler water; alkalinity, control, necessity of, 1816 blow-down water, sulfate determination, 825 calcium carbonate and sulfate, solubility data, 811, 816 carbon dioxide, solubility, 1827 conditioning, literature review, 441 heavy water, concentration and, 2031 H-ion concentration, determination, 1148 hydroxide determination, accuracy, 817 oil in, and in sludge, 1654 oxygen, solubility, 1827 silica removal, magnesia and sodium aluminate and, 1160

sodium carbonate in, decomposition, 816, 1158

softening, carbonate vs. phosphate, 428

sulfate determination, volumetric, 1817, 2028 trisodium phosphate treatment:

continuous blow-down and, 1822 see Books

Bolivar, Mo.; water and sewerage improvements, 970

Bond; see Financing Books, new; 2031

A Comprehensive Treatise on En-

gineering Geology, 1833 Manual of Practical Chemistry for Public Health Students, 2037 Alimentation en eau des villes. Évacuation des eaux usées et des résiduaires. Livre II. Procédés d'analyse et de contrôle des eaux d'alimentation et des eaux usées.

2037 Boiler Feed and Boiler Water Soft-

ening, 2037 Boiler Feed Water Treatment, 2037 Specifications. British Standard No. 603. 1935. Lead Pipes (B.

N. F. Ternary Alloy), 2037 ross Connections in Plumbing Cross and Water Systems (Wisconsin). 971

A Bibliography of Books, Dams. Periodicals and Society Publica-tions Appearing from January, 1924, through March, 1936, 1667

Das Wasser in der Industrie und im Haushalt, 678

Determination of Free Chlorine in Drinking Water, etc., 2037

Die Welt der Bakterien, 679 Dissolved Oxygen in Boiler Feed Water, 2037

Droughts of 1930-34, 1164, 2038 Flood Discharges in the United

States: Magnitude and quency, 564

Le problème des eaux résiduaires industrielles, 2037

Long versus Short Body Fittings for Water Supply, 679

Procedure Handbook of Arc Welding Design and Practice, 2037 Qualités de l'eau et moyens de cor-

rection, 2037

Report on Water Pollution. National Resources Committee, 160 Run-off Formulas and Methods Applied to Selected Ohio Streams.

F

F

Sedgwick's Principles of Sanitary Science and Public Health, 1833 Sewage Chlorination Studies, 1162 Steel Dams, 2036

Surface Runoff Phenomena. Part I. Analysis of the Hydrograph, 1833

The Biology of the Iron and Manganese Cycle, 566

The Chemistry of Cement and Concrete, 1833

The Chemist's Year Book, 1936 1667

The Work of the Sanitary Engineer.

Water Engineer's Handbook and Directory, 1935, 2037 Water Purification Control, 1666

Water Rights for Irrigation, 2036 Borax; as an acidimetric standard. 1447

Borehole; see Well

Borga, Finland; water purification. 1656

Boron; in natural waters, 1153 in sea water; 556, 1827 determination, 1826

Boston; hydrant spacing, 677 Metropolitan Water District; Quabbin aqueduct, geologic features, 1435

Quabbin dam, foundation permeability tests, 1435

Quabbin reservoir; 951 project; history, 1435 progress, 146
Boulder Dam; see United States

Bureau of Reclamation Brainerd, Minn.; meter reading and billing, 1444

Braintree, Mass.; filter plant, new,

taste and odor, carbon and, 157 Brewing; waste; composition and uses, 971 studies, 970

water; algae, copper pipe or treatment with copper filings and, 1144

treatment; carbon and, 1145 Katadyn and, 1144

Brick; classification by water absorption, 670

Brilliant green; see Bacterium coli; Bacterium coli test

Bromine; recovery from sea water, 2028

see Chlorination, taste and odor; Taste and odor

Bubbles; oxygen solution from, 1147 in vertical tubes, velocity and, 557 Budapest; iron and manganese removal, 822

Buffalo, N. Y.; Niagara River pollution and, 831

Burnt Mills, Md.; new filter plant and cost, 565

Cajalco Dam; see Metropolitan Water District of Southern California Calcium bicarbonate; solutions, decomposition by air passage, 1824

see Alkalinity
Calcium carbonate; deposition as
protective coating; 1159

lime and, 668 with rust, 2030

solubility in boiler water, 811, 816 see Alkalinity; Corrosiveness; Hardness; Pipe, cast iron; Pipe corrosion

Calcium determination; errors and,

micro, 1658

as oxalate; 426, 1827 micro, 432 nephelometric, 550 washing and, 1827 palmitate and, 821

photoelectric, 1825 Calcium hydrosilicate; see Micro-

porite

Calcium hypochlorite; germicidal efficiency, pH, temperature and available chlorine and, 672

solutions, available chlorine determination, 819 see Hypochlorite; Swimming pool;

Well Calcium sulfate; solubility in boiler

water, 811, 816 see Boiler scale

Calderwood Dam; see Aluminum Company of America

Cali, Colombia; metering, consump-

tion and, 1441 California; sewage farming in, 970 South Coastal Basin, underground

water storage, 2019 stream gaging, automatic radio 'transmitters and, 1831

water; rights, supreme court decision, 143

supplies; data, 2010 testing, 1155

Cambridge, Eng.; softening plant, 827

Cambridge, Mass.; filter operation,

Canada; filter plants, list, 2022 water works systems and officials, directory, 290

Canal; lining, concrete, 555

Canal Fulton, O.; water supply, flood and, 1156

Caporite; see Chlorination

Carbon, activated; evaluation; 151, 968

cataphoretic velocity and, 559 unit, activation number and, 968 filtration through, bacterial removal and, 427 powdered; application; with alum,

289

method, 289, 1815 point of, 1668 to reservoir, 281 dosage, 1668, 2025 regeneration, 1146

specifications, 1664 treatment: 962

bibliography, 435 cost, 435

see Alum; Coagulation; Color removal; Copper sulfate treatment; Dechlorination; Filtration, rapid sand; Filtration, slow sand; Fluorine; Hydrogen sulfide; Oil removal; Organic matter; Phenol; Taste and odor

ter; Phenol; Taste and odor Carbon dioxide; free; and combined, equilibrium, 428

determination, 1656, 1824 removal; aeration and; 148, 828, 1143, 1438, 1656, 1668

and lime, 827, 1656 marble filtration and, 1143

solutions, decomposition by air passage, 1824

see Acidity; Boiler water; Corrosiveness; Filtration; Heating system; Lead; Spirogyra; Steel

Carbonate; see Alkalinity; Carbon dioxide; Hardness

Carbonation; 954, 970, 1656
Diesel engine exhaust gases and, 834, 953
see Softening

Carson City, Nevada; pipe lines, 954 Catadyn; see Silver

Catechol; see Gas and coke works Catskill, N. Y.; purification plant

operation, 1442 Cattle, poisoning; selenium and, 1159 sewage and, 1823

Caulobacteriales; 672

Cellulose; waste, composition and Chloramine; determination, Ness. uses, 971 see Sulfite

Cement; heat of hydration; determination, 1150 factors, 1149

Portland; compounds in, 671 heat evolution and contraction, compound composition and, 559

manufacture, 669

paste, hardening, water absorption during, 670

sulfate resistance, determination, 2027

progress, 558

water, action on, 662

see Books; Concrete; Mortar; Pipe Ceriodaphnia; chlorine and, 1828

Cesium; detection, 1827 determination, 1825

Chambon Dam; 2022 Channel; open, back-water and dropdown curves, formulas, 1435

Chara; control, 1813 taste and odor and, 1813

Cheese factory; waste treatment, alum and lime and, 547

Chelan Hydro-electric Project; flow line losses, 436

Chemical; bins, shape, 671 pneumatic transport, 965

Chemical feed; 671 dry; 828, 1815 automatic, 2032 vs. solution, 1815

see Ammonium sulfate; Carbon; Iron chloride; Lime; Swimming pool; etc.

Chemistry; see Books

Chesapeake and Ohio Railroad; blowdown, creosote loss from ties and,

Chesapeake and Potomac Telephone Co.; valuation case, 1832

Chicago, Ill.; amebic dysentery outbreak, 1155, 1432, 1812, 1830 Cermac station, progress, 146 Chicago Ave. tunnel, progress, 146 chlorine determination, 560

crib chlorine-ammonia Dunne plant, 423 filtration efficiency formula, 286

Harrison Street station, electrification, 1813

water supply; disease, danger and, 1436 public health and, 811

Chicago Sanitary District; sewer tunnels, 274

lerization and, 556 di-, germicidal action, 822

see Chlorination; Chlorine, free, determination; Dechlorination Swimming pool; Taste and odor Dechlorination;

Chloramine-T; chlorine absorption by organic matter, rate, pH and. 1655

determination in solution containing hypochlorite, 1653

germicidal efficiency; active and total chlorine and pH and, 428 temperature, pH and available chlorine and, 672

Chloride; determination; nephelometric; 550

electrometric, comparison, 558 photoelectric, 1825

permissible concentration, 2016 see Corrosiveness

Chlorination; 434 ammonia and; 277, 434, 551, 828, 834, 962, 1163, 2011, 2025 addition after chlorine, 440 aftergrowths and, 547, 835

contact period and, 423 copper sulfate and (cuprichloramine), 443 cost, 1666

dosage, ratio, 440, 818, 1162, 1442 efficiency and, 818

C

gas vs. salts, 443 H-ion concentration and, 442, 548 mixing, importance, 2025 preformed chloramine and, 443

residual, practice, 555 apparatus; 552, 668 automatic; 555, 1152, 2032

fire pump, 157 for Caporite, 1816 containers; handling and storing, 1814

ton; 280, 423

leakage, tank containing caustic soda and, 423 electrolytic cells, 432

gas withdrawal rate, temperature and, 1814

high-capacity, 423

leakage, tracing and stopping, 1814

piping and prevention of condensation in, 1814 rooms, forced ventilation and,

423 for sodium hypochlorite, 1818,

1825 bacterial count, high, iron and

manganese protective colloids and, 547 bacteriostatic action?, 822 Caporite and, 445 copper sulfate and, 1144 corrosiveness and, 1158 dosage; 287, 434, 555, 818, 827, 1162, 2025, 2034, 2035 chlorine absorption and, ratio, 817 double, 287 emergency, 677 extent employed, 1154 fauna of reservoirs and, 818 goldfish and, 814 H-ion concentration and, 442, 548 plants and flowers and, 814 pre-; 1655, 2034, 2035 ammonia and, 970, 2035 residual; 555, 678 ultra-violet light and, in presence and absence of ammonia, 2034 silver salts and, 1144 spore-formers and, 434 see Bathing beach; Books; Chloramine; Chlorine; Coagulation; Condenser; Dechlorination; Filtration, rapid sand; Hydrogen sulfide; Hypochlorite; Main; Manganese removal; Microscopic organisms; Swimming pool; Taste and odor; Vessel, navigating Chlorination, taste and odor; ammonia and; chlorinous, main deposits and, 1666 history, 1434 phenol and; 289 ammonia and; 289, 548, 551, 818,

pH and, 442 bromide and, 834 hydrogen peroxide and, 818 permanganate and, 818, 833 superchlorination and, 833 see Odor: Taste and odor Chlorine; compounds, organic, germicidal efficiency, active and total chlorine and pH and, 428 handling; 1814 precautions and, 2028 manufacture from salt and nitric acid, 557 masks, rules for use, 1814 properties, physical, 1814 see Chlorination; Cylinder Chlorine absorption; ammonia and, 442, 551, 1156 H-ion concentration and, 442

organic and inorganic compounds and, 1156 oxygen consumed ratio, pollution and, 667 sewage compounds and, 1162 ultra-violet light and, in presence and absence of ammonia, 2034 see Azochloramid; Chloramine-T; Sodium hypochlorite Chlorine, free, determination; chloramine and, differentiation, methyl orange and, 279 fuchsin and, 431, 1654 germicidal, iodometric and o-tolidin, 1655 starch-iodide, 278, 1818 o-tolidin: 968 accuracy, 444 algae and, 1813 iron, interference; 968, 1824 avoiding, 278, 1159 manganese, interference; 968 avoiding, 278, 1159 nitrite, interference; 968, 1824 avoiding, 278, 1159 photoelectric, 1152 in square bottles, revised standards and, 560 standards; improved, 965 new, 2035 sunlight and, 278 temperature and, 278, 1824 time and, 1158, 1824 turbidity, compensating comparator and, 560 see Books; Calcium hypochlorite; Chloramine-T; Hypochlorite Cholera; Hamburg-Altona epidemic, 1143 water-borne epidemics, 1823 Christopher, Ill.; new filter plant, 1443 Cincinnati, O.; filter plant; early, 280 remodeling, 283 Citrate; see Bacteria, colon group; Bacterium coli test Clarifier: see Softening Clay; cellulated, 559 see Coagulation Clay, bleaching; see Taste and odor Cleveland, O.; alum dosages, low, results with, 2032 filter and troubles and cleaning, 2036 Coagulation; 1142 alum and; 1439, 1442 aeration and, 2029 carbon and; 2029 saving and, 1443

chlorine and, 287

clay or Fullers' earth addition, dosage and, 2029 corrosiveness and, 431 dosage; 1162, 1658, 1668, 2025 electrolytes and, 1658 low, results with, 2032 double, 1668 floc formation, 660 H-ion concentration and, 1150 and lime, 1655 reaction, time and, 431 residual alumina and, 431 soda ash and, 1159 and sodium aluminate, 157 vs. sodium aluminate, 431 temperature and, 1150 water composition and, 1150 carbon addition and, 150 chlorination and, 828 developments, 2011 ferric chloride vs. alum, 1813, 2029 ferric salts and; floc formation, ions and, pH and, 437 and lime, 1442 residual iron and, 437 ferric sulfate and, 677 iron salts and, floc formation, 660 mixing and; 1436 period, 287, 422, 563, 828, 965, 1442, 2033 rapid initial, necessary?, 2033 velocity, 2033 reagents, new, 834 sodium aluminate and, 430, 434 split treatment and, 828 see Color removal; Fluorine; Iron removal; Manganese removal; Mixing; Softening Coagulation basin; baffling, 291 circular, 1665 retention period, 287, 422, 965, 1439, 1442, 1668 sludge; removal, continuous, 283, 962 stabilization, carbon and, 150 two-stage, 962 two-story, 965 see Sedimentation basin Coal; ash; clinker formation, factors, composition, 1445 washing, effluent, sludge recovery, 971 see Boiler furnace; Filtration, coal;

Mine

Coating; corrosion fatigue and, 815

see Corrosion; Paint; Pipe coating Coke plant; see Gas and coke works

of ferrous materials, 671

Collection; see Billing

Colloid; see Chlorination; Engine, internal combustion Colne Valley, England; softening plant, 433 Color; algae and, 677 Color removal; 433 alum and; 827, 2029 H-ion concentration and, 1150 and lime, 2029 soda ash and, 1159 temperature and, 1150 water composition and, 1150 Caporite and filtration through sand and carbon, 1816 ferric chloride and, 827, 2029 filtration; pressure, sand and carbon, 1813 slow sand; 292 carbon layer and, 434 lime, excess, and, 827, 1656 ozone and, 433, 1439 permanganate and, 827 see Coagulation Colorado; mottled tooth enamel. fluorine and, 824 Colorado River water; dissolved solids, content, 2020 selenium in, 556 see Metropolitan Water District of Southern California Columbus, Ohio; O'Shaughnessy Reservoir, silting, 2011 Committee reports; licensing of water works employees, 560 Complaints; handling, 444, 970 Concrete; lean mixtures; vibrated, shrinkage, 2017 water-cement ratio and, 2017 permeability, surface treatments and, 1826 plastic flow and, 669 volume change, factors and control, water, action on, composition and, 662 see Books; Canal; Cement; Dam; Mortar; Pipe, concrete; Reser-Condenser; algal and slime growths, chlorination and, 1146. cooling water, lime softening, 2031 Conductivity; see Solids, determination; Water analysis Conduit; materials and, 555 see Aqueduct; Canal; Pipe; Tunnel Connecticut; cross connections, survey, 676 factory drinking water supplies,

survey, 829

pollution control, tri-state program, 957 typhoid and, 1155 water supply systems, 1155 Construction; see Contract Consumption; air conditioning and, 439, 566, 954, 958, 1142, 1815, 2038 apartment houses and, 963 Berlin, 1145 California and, 2010 economic conditions, as index of, Erie, Pa., 1162 Geneva, Switzerland, 676 industries and, 1143 Kitchener, Ont., 290 London, England, 443 London, Ont., 288 metering and, 288, 1153, 1441 refrigeration and, 566 sprinkling demand and, 272 trends, 285 Contract; construction, 969 law and, 282 Copper; concentration, permissible, 1144, 1147 corrosion; factors, 427 hydrogen sulfide and, 2030 in sulfuric acid, oxygen solubility and, 1444 determination; 443 colorimetric, hematoxylin and, 429 health and, 1149 protective coating; cuprous oxide in, determination, 1657 formation, 1152, 1657 removal; ferric floc and, 434 iron and, 549 synthetic resins and, 430 salts, use in water purification, 1657 taste and, 427 see Brewing; Hot water system; Paper; Pipe, copper; Services; Swimming pool Copper sulfate treatment; 291, 434, 1144, 2035 application; distribution over ice in spring, 2035 scattering disc and, 1813 carbon addition and, 281 chlorine and ammonia and, (cuprichloramine), 443 dosage, 291, 2034 history, 2028 resistant strains, development, 292 of spring water, 951 see Chlorination; Swimming pool Corrosion; 970

coatings, metallic, and, 429

dissimilar metals and, 968 inhibitors and, 668, 1814 oxygen and, 823, 968 prevention, 1142 tests; 813 rust removal for, 813 theory; 967 electrolytic, 813 see Boiler corrosion; Copper; Engine, internal combustion; Filtration; Hot water system; Industrial wastes; Iron, cast; Iron corrosion; Lead; Pipe, cast iron; Pipe corrosion; Pipe, galvanized; Services; Soil; Solder; Steel; Services; Soil; Sol Water, ground; Zinc Corrosiveness; aeration and, 968, 1143 alum coagulation and, 431 carbon dioxide and, 2030 chloride and, 2030 chlorination and, 1158 composition and, 662 correction, 433, 675, 678, 834 hardness and, 2030 H-ion concentration and; 678, 1149, 2030 calcium carbonate alkalinity, increasing and, 969 hydrogen sulfide and, 2030 lime and; 292, 968, 1143, 1163 calcium carbonate saturation and, 1163 limestone, filtration through, and, 951 magno-masse, filtration through, and, 1143 marble, passing over, and, 1149 oxygen and; 2030 removal and, 968 protective layer formation, treatments for, 1143 red water; aeration and, 2015 H-ion concentration and, 678 marble, filtration through, and, sodium carbonate and hydroxide and, 1143 softened water; lime-soda-zeolite, pH and carbonate hardness adjustment and, 2032 zeolite, sodium hydroxide and silicate addition and, 1155 see Boiler corrosion; Calcium carbonate; Corrosion; Iron corrosion; Lead Coshocton, Ohio; intestinal disease epidemic, 1664 water supply, flood and, 1156 Crenothrix; 2015

iron in water and, 552 see Bacteria, iron Cresol; fish and, 1823 in road tar, and solubility, 429 Cross connections; 2033 air conditioning and, 566 amebic dysentery and, 444, 1155, 1432 check valves and; 676 reliability, 157 chlorinators, automatic, and, 157 control, city, 2033 factories and, 829 hospitals and, 1812 plumbing and; 1814 siphonage and, 830, 958, 1155, 1812 refrigeration and, 566, 1812 regulations, status, 157 sewage pump priming and, 1812 survey, procedure, 676 water supply certification and, 157, 444 well supply, pumping into mains to reverse meter, 2034 see Books Crystal violet; see Bacterium coli test Cumasina; see Swimming pool

Cumasina; see Swimming pool Custer Co., South Dakota; spring, cattle poisoning and, selenium and, 1159 Cyanide; determination, 826 waste, trout and, 660, 1817

Cyanide; determination, 826
waste, trout and, 660, 1817
see Gas and coke works
Cyclops; chlorine and, 1828
Cylinder; compressed gas, carriage
for, 825
glass, new type, 1447

Dallas, Tex.; new elevated tank, 152
Dam; arch, model study, 437
buttress, articulated, proportions,
equations, 436
concrete; construction, 553
Cyclopean, gravity; 2022
failure, 2017
lime, leaching of; carbon dioxide
and, 546
pH and, 669
repair, 546, 669
mix design, trial-mix method,
1832
new, 2024, 2025
costs, unit, 1915-34, 284

1833 construction, 1432 costs, unit, 144, 278 design, models and, 1433 hydraulic-fill; construction, 274

earth; compaction, Proctor method,

core sampling device, 149
materials, field-testing equipment, 149
shrinkage data, 425

I

leakage, grouting with earth and cement and, 2018 new, 2025

rolled-fill, material selection, 554 erosion, hydraulic jump and, 276 foundation permeability, determination, 1435

highest, outside of United States, 2022

masonry, on earth foundation, seepage under, security from, 439 progress, 834 raising, unit prices, 285 on sand, uplift and seepage under, 439

spillway, model tests, 286 stress function and photo-elastic-

ity, 435
see Books; Gate
Damp-proofing; tar products and, 558
Daphnia; chlorine and, 1828
Deacidification; see Acidity
Deacration; see Boiler feed water

Deaeration; see Boiler feed water Dechlorination; carbon and; 1146, 1164 filtration and; 445, 822

corrosion and, prevention, 822 in sand filters, 150

chloramine and, thiosulfate, hydrogen sulfide, ferrous salts, ethylene and carbon filtration and, 1820

hydrogen peroxide and, 817 magnesium and; 149, 434 carbide and, 150 sulfur dioxide and; 291 equipment, solution lines, e

equipment, solution lines, etc., 144 ton containers, handling, 144

thiosulfate and, 291
Defiance, Ohio; odor, amines and,
2035

Degasification; see Boiler feed water treatment Delhi, N. Y.; flood damage, 677

Deini, N. Y.; nood damage, 677
Denver, Colo.; filtration, coal, 281
Fraser River diversion project,
progress, 145
turbidity signal, photoelectric, 1813
wood-stave pipe, practice, 143

wood-stave pipe, practice, 143
Desiccator; crucible support, 1447
Detroit, Mich.; pressure, elevated
tanks and, 272

P. W. A. projects, 957 Devil's Stream, Ia.; runoff, high, 2018 Diarrhea; epidemic, water-borne, 151, 1668 see Disease

Disease; ice and, 1822 intestinal, epidemic, 1664 water-borne, liability and, 955

see Cholera; Diarrhea; Dysentery; Enteritis; Fish; Intestinal influenza; Saturnism; Typhoid; Vessel

Disinfection; see Sterilization

d

Distilled water; apparatus, 660 carbon dioxide- and ammonia-free, continuous production, 556 production, 671

Distillery; waste treatment, 1668 Distribution system; bacterial

growth on pipes, 2015 flow analysis, 2012 maps and records, 2017 materials, selection, 969 problems, 1814

valves; inspection; 969 frequency, 1814 maintenance, 969 pressure-reducing, 1814 records, 969

Fire protection; Hydrant; Main; Materials; Pipe; Services; Valves; etc.

Dominick-Lauter medium; see Bacterium coli test

Doucil; see Softening

Dredging; Fort Peck plant, design, of reservoir, equipment and cost,

Drew, Miss.; sewage nuisance, court decision and, 956, 959

Drill bitts; detachable vs. forged, 2023 hardening and tempering, 552

mechanical dressers and, 440 Drought; see Rainfall

Dyeing; sulfur blacks and, waste treatment, 549

Dyes, triphenylmethane; bacteriostatic action, 1150

Dysentery, amebic; cross connections and, 444, 1155, 1432, 1812 food and; 1830

handlers and, 1432 in Spanish America, 1441 water and, 1432, 1441, 1830 see Endameba histolytica

Earth: equipment for screen analysis and determination of moisture and voids, 149 see Dam; Soil

Earthquake vibrations; machine for simulating, 2020 see Tank

East Rochester, N. Y.; softening plant, 1813

Eau Claire, Wis.; new well supply, 559 pipe line, river crossing, 560

Eijkman test; see Bacterium coli test El Capitan Dam; see San Diego El Paso, Tex.; water supply, protecting, 829

Electric power plant; Diesel-driven, large, 555

Electric wiring; grounding to water pipes, corrosion and, 664

Electrical instruments; 444 Electrolysis, stray current; 968, 1143,

coatings and, 665, 1827 drainage and, 665

insulating couplings and, 665

Elmore, Ohio; softening and correction of corrosiveness, 1155 Emergency service; equipment, 1812

radio and, 1812 Endameba histolytica; carriers, inci-

dence, 1830 life cycle, 1830 see Dysentery

Endo medium; see Bacterium coli; Bacterium coli test

Engine, Diesel; exhaust gases; heating and, 834, 953

water carbonation and, 834, 953 see Electric power; Pumping station

Engine, gasoline; see Pumping station Engine, internal combustion; corrosion, 1148

scale prevention, colloids, sodium aluminate, carbonate and phos-phates and, 1148 England's broth; see Bacterium coli

test

Ennis, Tex.; mottled tooth enamel, fluorine and, 968

Enteritis; outbreak, fishing in water supply source and, 952 see Disease

Erie, Pa.; water works, annual report, rates, consumption, costs, etc., 1161 Escherichia coli; see Bacterium coli

Etobicoke Township, Ont.; softening plant, operating data, 278
Eudorina; chlorine and, 1828
Evanston, Ill.; new elevated tank,

Evansville, Ind.; main cleaning, 964 Evaporation; from free surfaces at higher temperatures, 1445

Excelsior Springs, Miss.; mineral water resort, 1665

Feces: B. aerogenes in, 1821 Ferric; see Iron Filter; Bollman, underdrains, bronze recommended for, 2030 Bühring, 445

Chamberland, 445 tile, cellulated clay, 559 see Army

Filter gravel; size, determination, 1142

see Filtration, rapid sand Filter sand; size and uniformity coefficient, determination, 1142 see Filtration, coal; Filtration,

rapid sand Filtration; B. coli results, statistics, 2033

charcoal and, 445

corrosion, carbon dioxide and oxygen and, 1142

dirt penetration, 434 extent employed, 1154 plants; in Canada, list, 2022 cost, 278, 423

operation, 970 see Carbon, activated; Iron removal; Manganese removal; Well

Filtration, coal; 1142 and sand combined, 281

vs. sand; 281 effluent clarity and, 963, 1152 run length and, 963

silica dissolved by hot alkaline waters and, 1149 Filtration, double; 1143

Filtration, pressure; 288 plants, new, 1438, 1442 1661 units, horizontal, dirt accumulation and, 434

wash water percentage, 1661 see Color removal

Filtration, rapid sand; 677 efficiency; bacterial, low alum dosage and, 2033 expression of, 286

suspended matter removal, 2015 effluent observation basins, 287

gravel; depth, 287, 422, 965 disturbance during wash; 560

jet action at sand-gravel interface and, 279

head loss in, 156 and sand; size, dividing line between, 560

transition of sizes, 560 specifications, 1142

substitute, high gravity material.

head loss, calculation, 280 history, 1434 hydraulics of, 280

iron in water and, 964 operation, 964, 1142 plant; 962

automatic; 2032 semi-, 1443 cost, 563

design, 1142 early, 280 new, 149, 157, 159, 422, 563, 965,

1439, 1440, 1655, 1661, 1663, 2025 revamping, 280, 283

steel, cylindrical units arranged concentrically; 1668 and cost, 565

rate, 149, 287, 422

runs; 287 algae and, prechlorination and, 2035

carbon and, 678 coagulant dosage, low, and, 2032

fine filtering material overlain with coarse, 963 rate and, formula, 286

sand; cleaning; soda ash and caustic soda, 834

various methods, 2036 coating, bacterial multiplication and odor and; 2036

pre-ammonia-chlorine and,

wasting after wash and, 2036 eracking, 2036 depth, 287, 422, 965

mud balls; 155

specific gravity of filtering medium and, 963 standard of filter condition

and, 963 volume, measuring, 963

non-homogeneity and, 1142 size, 287, 422, 560, 828 specifications, 1142

substitute, pulverized coal slag as, 2032

taste and odor, wasting after wash and, 2033 underdrains; carborundum plates

and, 834 concrete blocks with glass-capped cells, 1665 design, 156

perforated pipe; 422, 965 rehabilitation, 834

vs. Wheeler bottom, cost and head loss and, 280

porous plates and, 156 Wheeler bottom, 1663 units, multiple, 1655 valves; electrically controlled, 954 few, and, 1442 wash; 280, 1142 air-water; 828, 1656 corrosion, Eternit pipe and, 1147 rate; 287 high, filtration efficiency and, 2011 sand expansion and; 155 measuring, 963, 1442 settlement and return to lake, surface, 155, 283, 963

carbon addition to, 150 percentage, 287, 1162 see Filter gravel; Filter sand; Fil-

tration, coal; Tank Filtration, slow sand; 432 bacterial removal, 2015

water; algae in, 565

chemical purification effected, 2015 cleaning, tractor machine and, 283 color removal; 292

carbon layer and, 434 hydrogen sulfide production; carbon addition and carbon layer and, 434

rate of filtration and, 435

iron removal, 292 operation; 964

cost, 283 organic matter removal, carbon layer and, 434

oxygen dissolved, decrease and, 2015

plant; 292, 1143 cost, 283

first in United States, 1442 new, 1444

pre-filtration and, 1443 see Filter sand

Financing; main extensions; assessment and, 292

guaranty bonds and, 292 municipally-owned works; bonds,

security, law and, 673 construction, law and, 673 debt limit, legal, 1660 funds diversion, 284, 285

private companies and, comparison, 825 profits, returning to consumers,

program and, 285 water securities, market conditions and, 674

water works costs, analysis, 1814 see Fire protection; Rates; Water, gratuitous

Findlay, Ohio; lime-soda and zeolite softening, corrosion and, 2032

Fire hydrant; discharge measurements, 280 identification, color and, 969

inspection, 969 maintenance, 969

records, 969 spacing, 677

thawing; anti-freeze and, 1665 carbide and, 155

electric, steam, alcohol, calcium and sodium chloride, Thermit, 145

traffic hazards, provision for, 832, 834

see Fire protection Fire insurance rates; storage, elevated, and, 274

water supply and, 1440 Fire protection; charging for, hydrant rental and, average, 675

court and commission rulings re. 159

liability and, 954, 955 underwriters' and insurance companies' service and, 444

water supply system and; 1440 cost and; 675

allocation and, 832 design and, 832

Fire protection, private; charging for, 676

Fish; amines produced on putrefaction, lime and, odor and, 2035 ammonia liquor and still waste and. 666

cresol and, 1823

hatchery, eggs and fry mortality,

illness caused by eating of, 2029 oil field brines and, 835 phenol and, 1823

tar-surfaced roads, washings and

see Goldfish; Lake; Perch; Purification, self; Sunfish; Trout

Flask, Erlenmeyer; cover for, 1447 Flint River; bacterial counts, unusual, 835

Flood; forecasting, snow survey and, 422

Houston, Tex., and, 2023 Muskingum Valley and, 1155, 1832 New England, water works and,

1814

New York, water supply emergency work and, 676

reservoir and, use for other purposes, 438

storage and, effect, determining, slide rule for, 275

stream gaging and, automatic radio transmitters and, 1831

see Books; Water work.
Flow; see Channel; Distribution system; Pipe flow; Water measurement; Weir

Fluorine; determination; 434, 547, 663, 815, 968, 1160, 1445, 1652, 1657, 1820

accuracy, 282 removal; 434

alum and, 282, 1827

alumina, activated, and regeneration, 2027

bone and, 282 carbon and, 282 lime and, 2028

magnesium metal and, 2028 sand containing aluminum, 1657 in water supplies, 433, 434, 968, 969 see Teeth

Fontana Union Water Co.; operation data, 561

Forest; see Reforestation; Watershed Fort Peck Dam project; diversion tunnels, driving and costs, 274 dredging plant, design, 2021 progress, 274

Fort Smith, Arkansas; water supply, proposed, 151, 159 Frankfurt, Germany; swimming pool,

Katadyn treatment, 1144

Freeman Engineering Corporation; elevated tanks, earthquakes and, model studies, 553

Frost; see Fire hydrant; Main; Services; Soil Fuchsin; see Bacterium coli test

Gainesville, Tenn.; Diesel engine, economy and, 824, 1440

Fullers' earth; see Coagulation

Gallionella; 2015 see Bacteria, iron

Galvanized iron; see Iron, galvanized Galvanizing; see Pipe, galvanized;

Garbage; see Incinerator

Gas and coke works; ammonia liquor, fish and, 666

ammonia still waste; cyanide removal, 1817

fish and, 666 treatment, 666 trout and, 1817

quenching effluent, coke slack recovery, 971

waste; phenol and; bacterial purification and, 426

catechol, oxidation, vated sludge and, 1150 removal, compressed air and, 818

E

F

H

treatment, 550 see Phenol

Gastroenteritis; see Disease; Typhoid; Vessel

Gate; roller; cost, compared with Tainter, 2013 design, 2013

operating machinery, 2013 see Distribution system; Valve

Geneva, Switzerland; water works extension and consumption, 676 Gentian violet; see Bacterium coli test.

Geology; see Books Germantown Dam; shrinkage, 425

Germany; typhoid, 1143 water works data, 1143 Glauconite; composition, distribu-

tion and uses, 820 Glencoe, Ill.; elevated storage, econ-

omy and, 272 Gloversville, N. Y.; water supply improvements, 1438

Goiter; iodine and, 1822 Goldfish; chlorine and, 814

Gorki, U. S. S. R.; new water supply,

Grand Rapids, Mich.; filter underdrains, carborundum plates and, 834

Grand Trunk Western Railroad; wayside tanks, elimination by direct pumping, 961

Gravel; see Filter gravel; Filtration, rapid sand

Great Britain; water supplies, 827 Greater Vancouver Water District; subaqueous pipe lines; maintenance, 146

removal and salvage, 146 shop and storage yard, access channel, 1831

Greensand; see Iron removal; Soften-

Greenville, Tenn.; taste, chlorineammonia and, 1434

Ground; see Earth; Soil; Water, ground

Gunite; see Standpipe; Tunnel Gypsum; structural, 669

Hague, Holland; swimming pool water treatment, 1144 Haiti; amebiasis and, 1441 Hamburg, Germany; cholera epi-demic, 1143

water works, 1143 Hamilton, Ohio; water softening plant, 2011

Hammermill Paper Co.; intake pipe, cleaning of, 275

Hardness; health and, 827, 828

origin and nature of, 827, 967 see Corrosiveness; Soap; Softening determination; Blacher Hardness

method, 1654 calculation from sulfate content,

1150 cottonseed oil, potassium salts of,

and, 666 palmitate and, 825

soap method; study of, 1818 Wanklyn's solution vs. Clarke's

lead oleate, 546 see Calcium; Magnesium

Hartford, Conn.; Bills Brook Dam, unit prices, 2020

filter cleaning, 283 Health; copper and, 1149 plumbing and, 968 soft water and, 828

softening and, 827 total solids and, 1146 see Books; Disease

Heat prostration; salt in drinking water and, 1666

Heating system; coils, scale removal, buffered acids and, 1147

corrosion; 1147 cold water admission into hot return lines and, 823

dissolved gases and, 671 steam, condensate, corrosiveness, oxygen, carbon dioxide and pH and, 816

see Hot water system

Hedley, B. C.; new water supply system, 2024

Heidelberg, Germany; Electro-Katadyn sterilization, 1144 Helena, Mont.; typhoid damage case,

955, 956 Hematoxylin; see Aluminum; Copper;

Iron Highway; see Tar; Water supply Hobart, Ind.; ozone treatment, 1439 Holland, N. Y.; new water supply and cost, 279

Hospital; fixtures, cross connections and, 1812

Hot water system; copper heating

coils; corrosion of galvanized pipe adjoining; 442

prevention, phosphate and, 442

tinning and, 442

oxygen depletion and, 442 galvanized pipe, corrosion, 823 galvanized storage tanks, corrosion, 426, 823

soft water, advantages, 827

see Heating system Houston, Tex.; ch chlorine-ammonia treatment, 440 Lighting and Power Co., customer

accounting, 829 rainfall and flood of December,

1935, 2023 Hudson River; pollution, 1658 Huffman Dam; shrinkage, 425

Humic acid; see Organic matter; Purification, self

Huron, Ohio; automatic filter plant, 2032

Hyde Park, N. Y.; purification plant, 1438

Hydrant; see Fire hydrant

Hydrogen-ion concentration; adjustment; 828

sulfuric acid and, 291 determination; 834, 1820 calculation and, 663 colorimetric, 663

electrometric, 663, 1148 interpretation, 834

see Boiler corrosion; Chlorination; Chlorine absorption; Coagulation; Color removal; Corrosiveness; Heating system; Iron corrosion; Iron removal; Lead; Pipe, cast iron; Pipe corrosion; Softening; Zinc

Hydrogen peroxide; removal, man-ganese dioxide and, 817 see Chlorination, taste and odor;

Dechlorination sulfide; determination, Hydrogen 1148

removal; aeration and, 288 carbon filtration and, 435 chlorine-ammonia and, 440

see Boiler corrosion; Copper; Corrosiveness; Dechlorination; Filtration, slow sand; Pipe, cast iron; Water, ground Hydroxide; see Alkalinity determina-

tion

Hypochlorite; alkaline, germicidal action, 822

determination; bromate vs. permanganate and, 664

solution containing chloramine-T, 1653 germicidal efficiency, active and total chlorine and pH and, 428

see Calcium hypochlorite; Chlorination; Sodium hypochlorite

Hypochlorous acid; solutions, analysis, 812 see Swimming pool

Ice; epidemics and, 1822

manufacture; carbon treatment and, 1145 Katadyn treatment and, 1144

see Refrigeration

Illinois; early water quality standard, 1435

Incinerator; 565

Incubator; inexpensive, construction, 662

Indian Territory Illuminating Oil Co.; pollution case, 1660

Indiana; pollution control legislation, 1154

Indianapolis Water Co.; pressure, elevated tank and, 273 Indicators; survey of, 2026

see Titration

Indole; detection in bacterial cultures, 427

see Bacteria, colon group

Industrial wastes; corrosiveness of, and bibliography, 2030

treatment; 2028 corrosion and, 1143 and cost, 959

studies, 1443 see Books; Cheese; Cyanide; Dyeing; Gas and coke works; Oil well; Sulfite; Textile; etc.

Infiltration gallery; in river bank, 433 Injunction; effect of, 956

see Sewage disposal Injury; law and, 282, 1662

Insects and water animals; pyrethrum or ammonia and, 1826

Intake; lake, low water levels and 2031

pipe; cast iron, 2031 concrete, 2021

steel; cleaning, machine and, 275 tuberculation and, 275

International Association for Research on Hydraulic Structures; organization, objectives, etc., 2022 Intestinal influenza; epidemic, Mil-

waukee, 1436 Iodine; determination, 552, 1158 iodoform odor and, 2014

starch test, sensitivity, 821 see Goiter

Iodization; 433

Iowa; fluorine removal, alum and, tooth enamel,

and, 1657, 1820 Iraq Petroleum Co.; pipe line, 425

Iron; preparation for painting, 556 in water; flocculation and, 548 limit and, 678
see Books; Chlorination; Chlorine,

free, determination; Filtration, rapid sand; Pipe, copper; Water, ground

Iron, cast; coatings, protective, 2030 grey, properties, corrosion, 1143 properties in relation to corrosion. 2030

see Pipe, cast iron

Iron chloride; ferric; feeding, 155 manufacture, 160 solubility, temperature and, 155 solutions, storage, 155

see Coagulation; Color removal; Softening

Iron corrosion; acid, gelatin as inhibitor, theory, 1652 H-ion concentration and, 1142

oxygen and, sulfite protection, 813 prevention; film, protective, nat-ural, and, 1142

oxygen removal and, 1142 phosphate and, 1142

rust, constitution of, 1657 see Corrosion; Corrosiveness; Pipe corrosion; etc.

Iron determination; colorimetric; 427 hematoxylin and, 429 in humates, "Ferron" and, 2026 thiocyanate and, 1445

step-photometric, 1149 titration, permanganate and, nitric acid and, 663

Iron, galvanized; corrosion tests, 1819 see Pipe, galvanized; Zinc

Iron hydroxide; ferric, colloidal, bactericidal action, 1819

sce Coagulation; Color removal; Iron removal

Iron removal; 433, 834, 964 aeration; coke beds and filtration, 1444

in coke trays and lime, alum as coagulant, 1668

and filtration; 288, 552, 1143 Reisert pressure system, automatic, 1661

and lime; 1163 and filtration, 1656

and settling, 1438 catalytic, 1814 chlorination and filtration, 822 filtration; Birm and, 552 magno-masse and, 1143, 2016. 2031 slow sand, 292 H-ion concentration adjustment and filtration, 552 lime and; 149, 955 and alum, 2029 and ferric sulfate, 1668 permanganate and greensand filtration, 552 resins, synthetic, and, 430 zeolite and, 278 Iron sulfate; see Coagulation; Iron removal; Manganese removal Irrigation; water, alkali coefficient and, 1146 see Books

Jackson, D. D.; biographical sketch, 2028 Jacksonville, Fla.; meter practice, 964 Javel water; see Vessel, navigating Jute packing; sterilization, 968

Kahoka, Mo.; sewage treatment, 970
Kansas; mottled tooth enamel, fluoride and, 1822
well supplies, regulations, 159, 2016
Kansas City, Kansas; elevated tanks
and booster stations, economy and,
273
Kansas City, Missouri; prechlorination ammonia and 970

tion, ammonia and, 970 Kingsland Point Park; bathing beach pollution study, 959

Kitchener, Ont.; annual report, 1934,

Laboratory; state department of health, personnel and equipment required, 970 water works', value, 290 see Purification; Treatment

Lakes; chain of, water supply and, 562 fisheries and, value, pollution and, 2029

levels, restoration, in Wisconsin, 2012

microörganisms in, 561
Lamesa, Texas; mottled tooth
enamel, fluorine and, 969
Lancaster, N. Y.; leakage survey, 279
Lancaster, Pa.; purification plant,
remodeled, 962

La Tuque, Que.; new wood-stave pipe line, 2024 Laundry, water; scale-buoy treatment, 286 soft, advantages, 827

Lausanne, Switzerland; pipe line over unstable ground, arch and, 287 Lead; determination; 1819

colorimetric, 427, 814, 826, 1144, 1146, 1823

in human bones, 443 removal, synthetic resins and, 430 solvency; 292, 442, 2012 carbon dioxide and, lime and, 551

carbon dioxide and, time and, 551 carbonate and, 443 H-ion concentration and, 441, 678 oxygen, carbon dioxide and acid radicals and, 441

radicals and, 441
radio earthing and, 441
water treatment and, 433
in water, form of, 443
see Pipe, lead; Services

Lead poisoning; diabetes and, 551 liver disorders and, 551 water and, concentration and, 551 Leadite; see Pipe, cast iron

Leadite; see Pipe, cast iron Leakage; damage to private property, liability and, 954

survey, results, 279 Leipzig, Germany; lead poisoning and, 551

manganese removal, 547, 822 sewage; irrigation and, 971 sand recovery, 2029

swimming pool, Cumasina disinfection process, 2016 Leptothrix; 2015

see Bacteria, iron Level; recorder, remote, 152 see Well

Lexington, Mass.; mains and services, thawing, 154, 292 Lima, Ohio; algal tastes, 2035

Lime; slaker, specifications, 1665 waterproof, 557 Lime treatment; 677, 1439, 1443 amines and, odor and, 2035 excess, sterilization and, 827, 1656 quick vs. hydrated lime, 280

solution lines, keeping clean, 156 see Acidity; Boiler feed water treatment; Carbon dioxide removal; Color removal; Corrosiveness; Fluorine; Iron removal; Lead; Manganese removal; Softening; Taste and odor

Limestone; see Corrosiveness Lincoln, Neb.; iron and manganese removal studies, 148 pipe line, leakage, 289 Liquid films; flowing, thickness, measurement, 2026 Little Falls, N. Y.; early filtration,

1434

Littleton, N. H.; water supply, 832 Locomotive; see Railroad

London, England; consumption, 443 cuprichloramine treatment, 443 Metropolitan Water Board, 1934

report, 443 reservoir design, algae and, 2024 typhoid and, 443

well water levels, decreasing, 827 London, Ont.; water works data, consumption, rates, meter practice, 288

Los Angeles, Cal.; chlorination, 554 distribution system experiences,

meter practice, 279

San Diego Exposition exhibit, 673 water supply, landscaping and, 1666 Louisville, Ky.; plant revamping,

savings and, 280 services, meters and hydrants,

thawing, 1665 bock, Tex.; mottled tooth Lubbock, enamel, 151

Lynchburg, Va.; new cast iron pipe line, 1439

MacConkey's medium; see Bacterium coli test

Madden Dam; see Panama Canal

Madras, India; carbon treatment, 434 slow sand filters, hydrogen sulfide and, 434

Magnesium; compounds, from sea water, 1446

see Dechlorination; Fluorine; Softening

Magnesium determination; as ammonium phosphate, washing and,

errors and, 1657 micro, 432, 1658 nephelometric, 550 palmitate and, 818, 821

photoelectric, 1825 Magnesium oxalate; solubility, 426 Magnesium phosphate; solubility, 1816

Magnetite; see Sewage treatment Magno-masse; acidity, iron and man-ganese removal and, 1143, 2016, 2030

Mahoning Valley Sanitary District; copper sulfate treatment, 2035

Main; cleaning; 1142 mechanical, results; 1439

and costs, 964 sterilization with chloride of lime after, 1439

costs, 278 dual, 1814

fittings, special, 1814 flushing; theoretical principles, 423

velocity, minimum, 423 freezing, dead end elimination and.

in frozen ground, heating of water before pumping and, 953 laying, in frozen ground, 953 locating, new device and, 953 old, rehabilitation, 834 outside city limits, law and, 953 repair, emergency, 440, 964

sterilization, 293, 968

in streets, property damage, law and, 282 thawing; compound joints and, 155

electric; 154, 292 and precautions, 144 steam and, 145, 154, 292

utilities, other, and: 1814 street space and, 561

see Distribution system; Electrolysis; Financing; Pipe Maine; roadside water supplies, 292

Manganese; black water and, 148 detection, 1656 determination, colorimetric, 427 pipe deposits and, 148

see Books; Chlorination; Chlorine, determination; free, ground

Manganese removal; 433, 834 aeration, chlorination, contact filters and filtration, 148

catalytic, 1814 chlorination and filtration, 822 ferric sulfate and, 677 filters, corrosion in, 2030

filtration and; 822 magno-masse and, 1143, 2016, 2031

manganese dioxide and, 547

lime and; 149 aeration and filtration, 1146, 1656 alum and, 2029

excess, and filtration, 827 pyrolusite contact filters; 148 cleaning, acid and, chlorine and,

resins, synthetic, and, 430 Manistique, Mich.; metering, 2010 Mapping; aerial photography and, 148

Marble; see Acidity; Carbon dioxide removal; Corrosiveness; Softening, Marion, Ohio; cross connections, control, 2033

Maryland; Bureau of Sanitary Engineering, 1935 annual report, 1667 -Delaware Water and Sewerage Association, 9th conference, 565 mine sealing program, 1668

populations served by water supplies and sewerage systems and plants, 1668

short school, 565

State Dept. of Health, tank paint taste and odor tests, 1830

typhoid and, 1668 Maryville, Mo.; purification plant

data, 970 Massachusetts; typhoid and, 952, 1156 water supplies; and sewerage systems, 1156

sources, recreational use and, 951 Materials; storage yards, improvements, 1813

see Purchasing

Meaford, Ont.; main flushing, 423 Mersey River; pollution, 828

Metals; heavy, determination, 1159 see Copper; Corrosion; Lead; Silver; etc.

Meter; accuracy at low flows, importance, 1662

large, turbine vs. compound vs. battery, 825

maintenance; 964, 970

commission and court rulings re, 159

practice, 279

progress, 834 records, 285 repair, 964, 1662, 1664

reversal by pumping well water into system, 2034

selection, 1663 testing; 964, 1441, 1662

commission regulations, 282 cost, 289

frequency, 288 machine, new, 1662

thawing; 1665 electric and steam, 154

see Venturi; Water measurement Meter reading; 444, 829, 1442, 1444, 2010

frequency, 279, 288, 964 Metering; Cali, Colombia, 1441 cost, 288

London, Ont., 288 Manistique, Mich., 2010 Milwaukee, Wis., 1662 Tueson, Ariz., 150, 560

see Consumption

Methyl orange; see Chlorine, free, determination

Methyl red; see Bacteria, colon group Methylene blue; see Bacteria, colon

Metropolitan Water District of Southern California; Cajalco Dam, 1833

Colorado Aqueduct: cement for. sulfate resistance, determination, 2027

progress, 145

siphon design, 1829 tunnels; construction, 553

projections, clearing, 1433 Parker Dam, progress, 145

Miami Conservancy District; rainfall and runoff data, 147

Miami River, Ohio; runoff study, 835 Michigan; Conference on Water Purification, 10th, 834

oil field pollution, 835 typhoid and, 835

Michigan City, Ind.; new filter plant, 563

Micrococcus roseus; Katadyn and, 441

Microcystis; taste, carbon and, 2035 Microporite; as building material, 670 Microscope; fundamentals and application to analysis, 2034

Microscopic examination; cubic standard unit and conversion to p.p.m. by volume, 2034

Microscopic organisms; 834 animal poisoning and, 428 chlorination and, 289, 1828

color and, 677 control, 433

H-ion concentration and, 434

in lakes, 561

number present, index of, cheese cloth pad on tap and, 2034

reservoirs and; designing to minimize, 2024

stratification and, 829

temperature and, 562 e Anabaena; Aphanizomenon; Brewing; Chlorine, free, determination; Condenser; Copper sulfate; Daphnia; Paper; Purification, self; Swimming pool; Synedra; Taste and odor; etc.

Midland, Mich.; Diesel engine drive, exhaust, uses, 834, 953

Millersburg, Ohio; water supply, flood and, 1156

Milwaukee, Wis.; filter plant, new, 146, 965, 1142

intestinal influenza epidemic, 1436 metering, 1662

pipe bends, reactions, diagram and, 276

pressure, tanks and booster stations and, 272

repair shops, 1661
Mine; abandoned, sealing; drainage, acidity reduction and, 1153

in Maryland, 1668

in Ohio, progress and cost, 1153 drainage, volume and acidity, 425 waste pollution; acidity and, 1163 bacterial content and oxygen demand of polluted water, effect on, 425

control, in West Virginia, 1164 Mineral content; see Solids; Water analysis; Water, mineral

Mineralead; see Pipe joint

Minkewitsch milk medium; see Bacterium coli test

Mississippi River; dams, concrete mix design, 1832 Missouri; P. W. A. projects, 970

Water and Sewerage Conference, 11th, 970

well construction, control, 971

Mixing; 1822 Aer-O-Mix and, 1668 baffles and, 1665 devices, 2033 flocculator and, 280, 283, 965, 1442,

mechanical, 563, 962, 1439, 1443, 1655

practice, 2033 rapid, 2025 spiral flow, 287, 422

see Coagulation; Softening Montana; well drilling regulations,

Montana; well drilling regulations, 552

Montreel Oue intakes existing and

Montreal, Que.; intakes, existing and proposed, 2020

Morris Dam; see Pasadena Mortar; leak-proof, 557

percolation, leaching and, 549 see Cement

Mount Sterling; aeration and lime treatment, 1155 Muskingum Valley; earth dams; con-

Muskingum Valley; earth dams; con struction, 1432 design, models and, 1433

flood, 1155, 1832

Muskogee, Okla.; new filter plant, etc., 1440

Naphthol;  $\alpha$ - and  $\beta$ -, solubility, 429 Narragansett Bay; oysters, water quality and, 957 National Resources Committee; report on water pollution, 1437, 1831 state planning, review, 1433 see Books

Natrolith; see Softening Nauvoo Black Creek Coal Co.; pollution case, 1660

Nesslerization, color; composition, 667

range, increasing, 667
Neutral red; see Bacteria, colon
group; Bacterium coli test

Nevada; flood forecasting, snow surveys and, 422

New Bedford, Mass.; new concrete supply line; 292

chlorination, 293 pipe manufacture, 293

New Brunswick, N. J.; new filter plant, 1442

New England; flood, water works and, 1814

water purification and typhoid, 674 New England Regional Planning Commission; activities of, 157 New England Water Works Associa-

New England Water Works Association; pipe line friction coefficients, committee report, 674

New Hampshire; pollution control, 830 Water Resources Board, tentative program, 2018 New Haven, Conn.; reservoir, copper

New Haven, Conn.; reservoir, copper sulfate and carbon treatment, 281 New Jersey; pollution control; 830

tri-state program, 957
Public Utility Commission, water
works costs, analysis, 1815
water supply and sewerage data,
1439

water utilities as investment, 156 water works, financial data, 825 New York, N. Y.; aquarium, new reservoir, 144

harbor pollution, 1658

rainfall study, 438
steel mains; bitumastic enamel
coating, condition, 291
mortar-lined, carrying capacity,
291

tunnel number 2, progress, 146 water, lead solvency, 2012

New York State; flood, emergency work during, 676 pollution control, tri-state pro-

gram, 957 P. W. A. sanitation projects, 831

typhoid and, 830 water, treated, population served with, 830

well drilling regulations, 552

Newburyport, Mass.; slow sand filtration, 292 River; pollution, Buffalo Niagara

and, 831 Nice, France; ozone treatment, 433,

2022 Nickel Plate Railroad; blow-down, creosote loss from ties and, 962

Niles, Ohio; see Mahoning Valley Sanitary District

Nitrate determination; in presence of organic matter, 819

Griess Nitrite; determination; method, 1447

in turbid water, distillation and, 443

see Chlorine, free, determination; Swimming pool

Nitro effect; water evaluation and, 548

4-Nitrocatechol; as titration indicator, 1446

Norfolk, Va.; chemical feed, 1815 Norit filter; bacterial reduction and,

427 dechlorination and taste removal,

Norris Dam; see Tennessee Valley Authority

North Carolina; stream pollution, court decision,150

water supplies and typhoid, 830

Norwalk; algae problem, 2034 Nozzle, flow; Venturi and orifice meters, relative merits, 964

Oak Hill, W. Va.; softening and iron removal, 1163

Odor; aeration and, 2029

amines from fish putrefaction or beet waste, lime treatment and, 2035

Asterionella, concentration and,

bacterial growth on mains and, 2015 determination; osmoscope and, 284 threshold method, 284

iodoform, iodine and, 2014 Weber-Fechner law and, 284

see Chlorination, taste and odor; Taste and odor

Ogden, Utah; artesian wells, Pine View Dam and, 2018

Ohio; Conference on Water Purification, 15th, 2031

filter plants, B. coli results, 2033 metering, consumption and rates, 1153

mine sealing, progress, 1153 rainfall, high record, 1832

softening plants, new, 1155 water supplies, drought and, 1154 water treatment, extension of, 831 water works funds, diversion of, 285

Ohio River; pollution; canalization and, 424

mine waste and, 1163

purification, natural, 429 Valley, ground water supply, geology and, 278 as water supply source, future and,

424

Oil; determination, 1822 removal, carbon filtration and, 1146 Oil well brine; disposal, 835

pollution; 835 court decision re, 960 fish and, 835

taste and, bromide and, 834 Oklahoma; operators, training, 441 Water and Sewage Conference, 10th, 159

Oklahoma City, Okla.; frozen pipes, thawing, 829 hydrants and valves, practice, 969 meter practice, 1441

North Side sewage plant, 160 Olean, N. Y.; typhoid epidemic, 833 Oligodynamic action; suspended mat-

ter and, 434 see Silver

Ontario; water and sewage works, projected, 1831

water supplies; data, 290 hardness, 278

Ontelaunee Dam; see Reading, Pa. Organic matter; removal, powdered carbon and, 442

see Chlorine absorption; Oxygen consumed; Purification, self Orifice; Venturi and flow

meters, relative merits, 964 Ortho; neglected for indexing pur-

Osakis, Minn.; well tests, 440

O'Shaughnessy Dam; see San Francisco

Osmoscope; see Odor

Owyhee Dam; see United States Bureau of Reclamation

Oxidation-reduction; equilibria, 2027 indicators, 2026

Oxyacetylene; cutting, advances, 143 see Welding

Oxygen; solution from bubbles, 1147 Oxygen consumed-chlorine sorbed; ratio, pollution and, 667

Oxygen demand; see Purification, self; Swimming pool

Oxygen dissolved; aeration and, 148, 827

deficiency, perch and sunfish as

indicators, 820 sunlight and, 667

see Boiler corrosion; Boiler water; Books; Copper corrosion; Corrosion; Corrosiveness; Filtration; Filtration, slow sand; Heating system; Iron corrosion; Lead; Pipe, copper; Purification, self; Steel

Oxygen dissolved, determination;

Admiralty Standard portable apparatus for feed water, 1816

colorimetric, 820 recorder, for feed water, 1816 Rideal-Stuart and Alsterberg meth-

ods, 819 in sulfite-deaerated feed water, 1654 Winkler method; boiler feed water and, 1147, 1816

errors and, 814

in presence of reducing and oxidizing agents, 819

reagents in tablet form, 1158 traces and, 661, 826

Oysters; water quality and temperature and, 957 see Shellfish

Ozone; odor, detection in air, dilution

and, 2022 Ozone treatment; 433, 443, 828, 1818, 1824

cost, 433, 1439

extent employed, 2022 history, 2022

see Color removal; Taste and odor

Paint; films, permeability to moisture, 2027 zinc surfaces and, reaction and, 1444 see Tank

Painting; iron and steel, preparation for, 556

Panama, C. Z.; amebiasis and, 1441 Madden Reservoir, completion, 145 Pandorina; chlorine and, 1828

Pann Mill, England; well level indicator, 2023

Paper manufacture; waste, composition and uses, 971

water for, algae, copper pipe or treatment with copper filings and, 1144 see Sulfite waste

Paratyphoid; epidemics, waterborne, 1823

see Disease; Vessel

Paris, France; ozonization, 433, 2022 water supply; 432 Val de Loire scheme, 433

well development, 674, 1664
Parker Dam; see Metropolitan Water
District of Southern California
Pasadena, Cal.; Morris Dam; con-

struction, 553
photo-elastic experiments, 436

Passaic; meter testing, 1662 Pennsylvania; Sanitary Water Board, Pittsburgh supply pollution and, 966

typhoid and, 833, 1154 water purification in, 1154 Water Works Operators' Association Journal, Vol. 7, 832

Pentane extraction waste; phenol content, 1823

Perch; oxygen deficiency and, 820 Permanganate; sterilization and, 1823 see Chlorination, taste and odor; Iron removal; Taste and odor

Permutite; see Softening Petri dish; rack for, 825

Petri dish; rack for, 825
Petrograd; ozone treatment, 433
Phenol; albuminoid ammonia, parallel changes, 820

decomposition in water, natural, 546

determination; colorimetric, 427, 820

inaccuracies, 1152 fish and, 1823

protein as source of, 820 removal from waste water; 1817

carbon and, 1823 in road tar, 429 solubility, 429

waste; literature review, 1823 treatment, 2029

see Chlorination, taste and odor; Gas and coke works; Pentane; Taste and odor; Wood distillation

Phosphate; see Boiler corrosion, Boiler feed water treatment; Boiler scale; Boiler water; Engine, internal combustion; Hot water system; Iron corrosion; Softening

Phosphate determination; colorimetric, 427

micro, 1817 step-photometric, 668

Photoelectric cell; see Turbidity determination

Pine View Dam; see United States Bureau of Reclamation

Pines-on-Severn, Md.; iron removal, 1668 water works, 565

Pipe; bends, reaction, determination, diagram, 276 cleaning, acid and inhibitor, 281 line; costs, unit, 1915-34, 284 diagonal, materials, formulae, maintenance, 150 new; 1438 sterilization with chlorine, progress, 834 submerged, removal and salvage, 146 welded, long, 425 progress, 1142 for salt water, tests, 565 see Aqueduct; Conduit; Main; etc. Pipe, asbestos-cement; see Pipe, cement-asbestos Pipe, brass; corrosive water and, suitability and, 821 see Services Pipe, cast iron; cleaning, 675 coating; exterior, asphalt and coal tar, 815 lining; bitumastic enamel, 293 tar, friction coefficient and effect of age; 674 pH and, 675 corrosion; coatings, natural and, 1143 composition, variations and, 815 soil; calcium carbonate and, 665 coatings and, 665 compacting and, 665, 815 H-ion concentration and, 664 hydrogen sulfide and, 665 looseness and, 664 silicon and, 158 sulfate and reduction and, 665sulfur and, 1143 joints; aluminum foil and, and cost, cement, 1661 lead-substitute, deleakage, crease with time, 563 Leadite, 2025 rubber gaskets and, 1161 line; leakage, 289, 2025 new, 1439, 2025 submarine; 560 unit prices, 291 for mains, 969 see Books; Iron, cast; Pipe, cement-lined; Pipe coating; Pipe joint; Pipe, cement; acid and permeability

tests, 2019 see Pipe, concrete

Pipe, cement-asbestos; 555, 1152, 1436 calcium carbonate protective coating, lime addition and, 668 carbon dioxide, action on, 668 mains of, 432 manufacture, 1825 Pipe, cement-lined; friction coefficient, 675 lining in situ; centrifugal process, 675 Tate process, 675 see Pipe, steel Pipe coating; 1827 application, methods, 153 bibliography, 153 bitumen vs. asphalt, 2030 exterior; asphalt; vs. bitumen, 1143 electrical drainage and, 815 coal tar, electrical drainage and, 815 electrical drainage and, 1653 enamel and asbestos wrapping, 425 Pyralin, 153 wrapping and, 1821 flaw detector, electric, 284 interior; bitumastic-enamel, friction coefficient, 675 bitumen, placing in situ, Eric process, 675 progress, 1142 progress, 834 rubber, vulcanized, 1821 testing, 153 value, electrical resistance as index, 153 see Coating; Electrolysis; Pipe, cast iron; Pipe corrosion; Pipe, steel; Pipe, wood; Plastics Pipe, concrete; 1436 friction coefficient, 675 line; costs, unit, 144, 275, 278 head loss, 436 prestressed, tests, 148 railway fill, jacking under, 275 steel-cylinder reinforced; 554 carrying capacity, 554 line, 293 manufacture, 293, 554 see Concrete; Intake; Pipe, cement Pipe, copper; algae and, 1144 corrosion; 430 iron and, 1823 oxygen and, 1823 pin-hole defects and, 1823 soil and, 664 water-air line and, 1823 pneumatic water system, copper in water and, 1147

protective layer formation, oxygen and; 1657
hardness and, 1144
solder for, 822
see Copper; Services
Pipe corrosion; 814
capacity reduction and, 1436
cathodic protection, 813, 1652
dissimilar metals and, 968
soil; calcium carbonate and, 563
cathodic protection; 154, 816, 1821
coal tar enamel vs. grease
coating and, 664

pH and, 563
prevention, soil compaction and,
563
sulfates, biological reduction

and, 563 theory, 665

tuberculation and, 665

see Corrosion; Electrolysis; Pipe, brass; Pipe, cast iron; Pipe, copper; Pipe, galvanized; Pipe, lead; Pipe, steel; Pipe, wrought iron; Plumbing; etc.

Pipe, Eternite; see Filtration; Pipe, cement-asbestos

Pipe flow; bends and, 438

discharge, computing, slide-rule and, 1830 friction coefficient, velocity and

friction coefficient, velocity and, 675

losses in Y-branch, 436 measurement, venturi flumes and,

side outlets, head gain and, 156 see Distribution system; Pipe, cast iron; Pipe, concrete; Pipe, steel;

Pipe, galvanized; soil corrosion and, 159, 430, 664, 823

see Hot water system; Iron, galvanized; Services; Zinc

Pipe joint; cement, 2016 flat-flange, design, 1161 gaskets and, 1161 materials, improved, 834

Tegul Mineralead, immediate tightness and, 2021

Tegul, new sulfur compound, 963 see Jute; Pipe, cast iron; Pipe, steel Pipe, lead; corrosion; acids, weak, and, 1818

resistance; alloying and, 1819 ancient and modern, 1818 scour lines in extruded pipe and, 1818

soil and, 430 tinning and, 430 pressure; limiting, 1151

resistance to, increasing, 1151

tellurium addition and, 1149 thickness, economic limit, 1151 see Books; Lead; Services Pipe locator; new device, 953

Pipe, steel; coating; asphalt, 292 bitumastic enamel, permanency, 291

interior, mortar, flow coefficient, 291 corrosion; electrical drainage and

815 soil, sulfur and, 1143

tuberculation and, 292 wrought iron and, comparison, 153

friction coefficient, 675 joints, lead, 954 line; cost, 275, 278 new, 146 old, 954

river crossings on bridges, rocker and suspender supports, 2023 riveted, head loss, 436

submarine, gunite-coated, unit prices, 291

welded; arching over unstable ground, 287 spirally, 954

P

F

F

F

P

F

see Electrolysis; Intake; Pipe coating; Pipe corrosion; Steel Pipe, wood-stave; coatings, 143

dry rot, ensuring saturation by perforation and, 143

invention and first use of, 143 line; 2024

cost, 2024
Pipe, wrought iron; corrosion, steel
and, comparison, 153
Pipe, zinc; for water, 1821

Pittsburgh, Pa.; pollution, Sanitary
Water Board and, 966
Plainties Torrest matted teath on

Plainview, Tex.; mottled tooth enamel, 151 Plandome, N. Y.; well water system

and hydropneumatic tanks, 1660 Plankton; see Microscopic organisms; Purification, self

Plastics; bituminous, flow properties, 1446

Plumbing; cross connection and, 1814 health and, 968 history, 968

siphonage and; 830, 1155, 1812 conditions causing, 958 vacuum and, 1812

water pipe, corrosion, electric grounds and, 664 see Books; Cross connections;

Water closet

Plumbism; see Lead poisoning Plumbo-solvency; see Lead Poland; goiter, iodine in water and. Pollution; cattle poisoning and, 1823 control; 830 interstate agreement and, 957 state, 1154, 1164, 1831 damages, liability and; 955, 959, proof required, 956, 1660 unforeseen causes and, 961 indicators of; B. aerogenes and, 1821 chlorine absorbed-oxygen consumed ratio and, 667 surface tension and, 1818 law and, status, 1437 National Resources Committee report, 1437, 1831 property depreciation, liability and, 956 sewage discharge and, injunction and, 955 standards, trend, 662 see Bathing beach; Books; Lake; Purification, self; Water, ground Pollution, industrial wastes; see Gas and coke works; Oil well; Phenol; Textile; etc. Pollution, stream; control; 830, 956. 959, 969 nation-wide, 959 court decision and, 150 losses from, 1658 prevalence, 1433 stream classification and, 434 typhoid and, 150 see Purification, self Ponca City, Okla.; new surface water supply, 2010

studies, 1814

see Alkali

manganate

project, 1831

metric, 1160

operation, 1442

Potassium; detection; 1446

spectroscopic, 1827

determination, 811, 1447

Potassium permanganate; see Per-

Potomac River; pollution control

Poughkeepsie, N. Y.; filter plant

Precipitate; heavy, estimating, area-

Power; see Electric; Steam plant

1663 Pump, Port Jervis, N. Y.; earth dam, leakage, grouting and, 2018

Port Philip Bay, Melbourne; pollution study, 1149

Portland, Me.; frost penetration 1162

Pressure; court and commission rulings re, 159 elevated tanks and: 272, 273 and booster stations, 272, 273 low, boiler collapse, and liability, 292 Protozoa; see Purification, self Providence, R. I.; filter operation, 283 water treatment, 677 water works developments, 677 Prussia; B. coli test, standard, 1156 Public; relations; 833 rulings re, 159 see Utility Public service commission; powers of, Public Works Administration: accomplishments in water works field, 1812 experiences, 157 Pulaski, N. Y.; water supply, 282 Pump; check valve slam, elimination. improvements, review, 1434 low lift, flood and, unit on carriage on inclined track and auxiliary on high ground, 1665 new, 1442 obsolescence and, 1813 pipe line, long, starting and, 2026 purchase, calculating total cost over period of years, 1815 surge, air chambers and, 156 testing, 440 Pump, air-lift; see Bubble centrifugal; electrically driven, pressure regulation system, performance curves, 950 testing, 950 Pumping cost; 150 Pumping station; booster, automatic, costs, 278, 423 drive; Diesel; 291, 1436 economy and, 834, 953 vs. gasoline engine, 289 -generator vs. gas- and oilfired boilers, costs and, 824 vs. steam, cost and, 1440 waste heat utilization, 834, 953 electric; 962 automatic operation, 1813 gasoline engine, 1436 standby, Di engine, 289 Diesel vs. gasoline steam; gallons pumped per pound of coal, 1162 turbine, automatic operation, 1813

equipment, selection, 969
historical review, 291
new, 287, 1440
operation; automatic, 279, 2026
cost; 150
elevated tank and, 272, 273

see Pressure; Well, pumping Purchasing; of equipment and supplies, 969

Purification; anions, removal, synthetic resins and, 1160, control; bacteriological, 970 chemical, 828

laboratory, 1436 developments, 154, 2011 literature review, 2033 plant; design, flexibility and, 422 equipment; automatic, 1813

progress, 834 typhoid and, 674, 835, 1154, 1155, 1156

see Books; Chlorination; Coagulation; Filtration; Silver; Softening; Sterilization; Treatment; etc.

Purification, self; bacterial increase, initial; in laboratory containers, 050

oxygen and, 817 protozoa and, 817, 818 temperature and, 666 bacterial reduction; humic matter

and, 442 rate; 429

plankton and; 429, 958, 1824 ratio of wetted area to volume and, 958 temperature and, 429

turbulence and, 958 bacteriophage and, 551 fish and, 546

oxygen demand and, 429 streams, artificial lakes and, 545 Pyrethrum; see Insect Pyrolusite; see Manganese removal

Queensland, Australia; drought of 1902, 966

Raccoon Creek; runoff study, 835 Radioactivity; spring water and, 662 Railroad boiler; blowdown; creosote loss from ties and, 962

ties and track structure and, 2026 corrosion; embrittlement and, 961 and pitting, cause and remedy, 961

explosions, low-water, prevention, drop plugs and, 961 feed water treatment; 280 lime-soda, equipment, 962 soda ash and, turbulent boiling and, 817

R

R

R

R

F

foaming, organic matter and, 1163 washout periods, extension of, 962 water, wayside tanks, elimination by direct pumping, 961

see Boiler Rainfall; Bermuda, 432 drought; of 1934; 147

London, England, 443
Ohio and, 1154
since 1881, 280
cartographic study, 966
cycles and, 825
Queensland, Australia (1902), 966
water supplies and, 970, 1154
well supplies and, 1154
heavy, 677

Houston, Tex., flood and, 2024 mean; period of record required to determine, 966, 967 relation of range of variation to,

relation of range of variation to 967 Muskingum Valley flood and, 1832

New York, study, 438 records, need of, 1436 runoff and, 147, 287 St. Thomas, Ont., 287 Seattle, Wash., 1662 sun spots and, 552 tree rings and, 552 see Books: Stream

see Books; Stream Raleigh, N. C.; sewage discharge, court decision re, 150, 956

Rates; 676
Erie, Pa., 1162
increase to provide surplus, 825
irrigation and, 969
law and; 955, 1661
private companies and, 1663
London, Ont., 288
making of, factors, 968, 2017

Ohio and, 1153 St. John, N. B., 158 service charge, 288 ton unit suggested, 1661 Tucson, Ariz., 150, 560

see Fire protection; Sprinkler system; Water, gratuitous Reading, Mass.; new iron removal plant, 1444

plant, 1444
Reading, Pa.; gas works waste treatment, 550
Moder Creek project, unit prices

Maden Creek project, unit prices, 144
Ontelaunee Dam, unit prices, 144
ecords: see Distribution system;

Records; see Distribution system; Fire hydrant; Meter; Rainfall; Runoff; Water analysis Reforestation; Providence and, 677 see Watershed

Refrigeration; cross connection and. 566, 1812

water consumption and, 566 Reservoir; algae, minimizing, design and, 2024

concrete, new; 144 leakage, 422 waterproofing, 422

impounding; banks, summer homes on, 952

fishing in, enteritis and, 952 new, 1438, 1444 recreational use, 951

silting, 2011

service; cost, 423 uncovered, interstate carrier supply certification and, 444 stratification and, 828

see Flood; Storage Resin, synthetic; anions, removal with, 1160

base exchange and, 430, 1160, 1813 Richmond, Va.; flocculator and, 283 lime solution lines, 156

Riparian; see Water rights Ritter; see Bacterium coli test River; see Books; Stream

Road; see Highway; Tar Rochester, N. Y.; iodide treatment,

water shortage, emergency measures and, 277 Rockport, Mass.; taste, copper sul-

fate and, 291

Rocky Mount, N. C.; new elevated tank; 1440

and filter plant, 1663 Rodriguez Dam; progress, 145 Rostone; manufacture, 670 Rotterdam, Holland; phenol and albuminoid ammonia, 820

Rubidium; detection, spectrographic, 1827

Ruhr River, Germany; natural purification, artificial lakes and, 545 Runoff; high, 2018, 2024

rainfall and, 147 records, need of, 1436 see Books; Stream

Russia; water supplies, frozen ground and, 953

Rutland, Vt.; concrete pipe, jacking under railroad, 275

Saint John; N. B.; rates, 158 water works, 158 Saint Louis, Mo.; Stacy Park Reservoir pipe line, progress, 145

Saint Louis County Water Co.; lime slaker specifications, 1665

Saint Paul, Minn.; water supply, lake chain, effect of, 562

Saint Thomas, Ont.; filter plant oper-ation data, 287 Salem, Mass.; new purification plant, 1438

Salle; see Bacterium coli test Salt Lake City, Utah; well supply; new and cost, 2025

water rights and, 277 Sampling; see Bacteriological exam-ination; Water, mineral; Well San Diego, Cal.; El Capitan Dam; field-testing devices, 149

progress, 145 San Francisco, Cal.; O'Shaughnessy Dam, raising, unit prices, 285 San Francisco Bay pipe line cross-

ing, unit prices, 291
Sand; see Filter sand; Filtration,
rapid sand

Sandusky, O.; intake, low water level and, 2032

Sanitary engineering; see Books Sanitation; see Books Santa Barbara, Cal.; bottled-water

regulations, 831 Saratoga Springs, N. Y.; water works, unit prices, 423

Saturnism; drinking water and, 1820 Scale-buoy treatment; 286 Schizomycetes; new order, Caulo-bacteriales, 672

Scioto River; runoff study, 835 Screen; tinned copper, corrosion by hydrogen sulfide, 2030

traveling, 288 Sea water; boron; content, 556, 1827 determination, 1826 bromine recovery, 2028

iron content and determination, 1445

magnesium compounds from, 1446 sterilization, ultra-violet ray, 1827 see Steel

Seattle, Wash.; rainfall, 1662 watershed reforestation and fire protection, 1662

Sediment; in suspension, transportation, principles of, 1437

Sedimentation; plant, world's largest, 963 in quiescent and turbulent basins,

theory, 1432 Sedimentation basin; cleaning; 280

mechanical, 963 guniting, 1440

laboratory studies, model law and, see Coagulation basin Selenium; Colorado River water and, 556 lethal dose, 1159 in spring water, 1159

Services; blowing out, compressed air and, 963 brass corrosion, 292 copper; 969

advantages, 283 friction loss and, 283 frozen, thawing, 155 depth, practice, 155 frozen, thawing; 1812 electric; 154, 292, 829, 1665

fire hazard and, 284 time and, 1665 steam and, 154, 292 galvanized; corrosion, 292

friction loss, 283 installation and maintenance, 2017 lead; friction loss, 283

solvency and, 292 materials, 834, 2017

trenches, joint use, 676 see Pipe, brass; Pipe, copper; Pipe, galvanized; Pipe, lead

Settling; see Coagulation; Sedimentation Sewage; B. aerogenes in, 1821

cattle poisoning and, 1823 pump priming, cross connections and, 1812

typhoid bacilli in, 959, 1151 see Bacterium coli test; Books Sewage treatment and disposal; 444,

559, 828, 964, 2028 activated sludge; 970

B. typhosum and colon-aerogenes group, longevity in sludge, 1816 diffuser mediums, 970

gas works' liquors, phenol and catechol oxidation and, 1150 litigation, status, 970

biology of, 970 cess pools, ground water pollution and, 832

chemical precipitation, 970, 2029 developments, 159

Dunbar beds and, 970 filters and; 560 magnetite and, 2030

fishponds and, 971 as governmental function, 956, 960

grease recovery, 971 Imhoff tanks and, 970 injunction and, 955 irrigation and, 970, 971 sludge digestion, 970

trends, 1830 see Books

Shawnee, Okla.; Deer Creek project. costs, 278 Shell Petroleum Co.; pollution case.

Shellfish; typhoid and, 833

see Oyster

Shenandoah, Ia.; purification plant valves, electrical control, 953 Shigella paradysenteriae; dissociation and, 672

Silica; colloidal, bactericidal action. 1819 determination, step-photometric. 668

form of in mineral waters, 550 see Boiler scale; Boiler water

Silicate; cleansers, 1445 see Corrosiveness

Silt; world's largest de-silting plant, 963 see Sediment; Turbidity

Silver; concentration, permissible, 1144

Silver, sterilization and; 1144, 1653, 1657

hardness, iron, manganese, hydrogen sulfide and temperature and, 663

Katadyn and; 433, 434, 441, 1820 albumen and, 441 electro-, 1144, 1820 organic matter and, 441, 1144 silver concentration and, 441 sodium chloride and, 441 silvered-sand and; 1816 reconditioning, 1816

see Oligodynamic; Swimming pool Singapore; water supply and sewage disposal, 964

Siphon: design, 1829

Slaughter house; waste utilization, Smithfield, N. C.; Raleigh pollution

case, 150, 956 Snow survey; flood forecasting and, 422

Soap; hard-water loss, scale-buoy treatment and, 286

manufacture; alkaline builders and, 671 dry saponification and, 671

soft water, savings and, 2025 softening, savings and, 955, 967 Socony-Vacuum Corporation; pollution case, 960

Soda ash; see Acidity; Boiler scale; Coagulation; Color removal; Corrosiveness; Engine, internal combustion; Railroad; Softening

Sodium; determination, colorimetric, 823

ðŧ,

ıŧ

see Alkali
Sodium aluminate; see Boiler feed
water treatment; Boiler water;
Coagulation; Engine, internal combustion; Softening; Taste and odor
Sodium carbonate; see Boiler water;

Soda ash; Softening
Sodium hydroxide; see Acidity; Boiler
corrosion; Corrosiveness; Softening
Sodium hypochlorite; chlorine absorption by organic matter, rate,
1655

solutions, deterioration, 822 see Chlorination; Hypochlorite Sodium iodide; see Iodization

Sodium phosphate; see Boiler feed water; Boiler scale; Boiler water; Softening

Sodium silicate; see Corrosiveness; Silicate

Sodium thiosulfate; solution containing sodium hydroxide and indigo carmine, stability, 819
see Boiler corrosion; Dechlorina-

tion Softening; 433 advantages, 827, 828, 967 barium; aluminate and, 433

> 2031 hydroxide and, 2031

base exchange; 545
aluminum in effluent and, 1825
corrosiveness and, sodium hydroxide and silicate addition

carbonate and hydrogen zeolite,

and, 1155 cost, 278, 827 H-ion concentration and, 1825 iron removal and, 278

vs. lime, advantages and costs, 827

materials; Doucil, 433, 827 glauconite, 821 greensand, 545 hydrogen permutite, 661 Natrolith, 1825 resins, synthetic, 430, 1160, 1813

Webbolite, 1825 zeolites; exchange capacity, aluminate content and, 1161

gel, drying, 1161 properties, 827

plants; 433 automatic, 1813 new, 827, 1155

regeneration, salt consumption, 278, 433, 827

taste and, 1825 theory, 549 wash water and waste percentage, 278, 827

developments, 159

extent employed, 1154, 1155 hardness, residual, practice, 278, 432, 433, 827, 1152, 1439 health and, 827 lime; 1163, 2031

ime; 1163, 2031 alum and, 2029 clarifier and, 955 excess; 955

iron chloride and, 1656 and recarbonation, 827

mixing and; 955 period, 2025 plant, new, 1155

and recarbonation, plants, 2011, 2025

-soda; 1163 dosages, calculating, 2031 marble filtration and, 666 plant, new, 1155 sodium aluminate and, 431

sodium aluminate and, 431 and zeolite, corrosiveness and, reduction, 2032 sodium aluminate and, 432, 1152

literature review, 2033
precipitation methods, sand or calcium carbonate addition and, 428
reagents required, calculating, 546

sludge disposal, 827 sodium aluminate and, 430 sodium phosphate and, 433 trisodium phosphate and; magnesium and, 1815

sodium carbonate and hydroxide and, 1816 see Boiler corrosion; Boiler feed

water treatment; Soap Soil; base exchange in, 662 corrosiveness; 158, 664, 815 oil and, 425

frost penetration; 953 sandy soil and clay and, 1814 study, 1814

see Earth; Pipe, cast iron; Pipe, copper; Pipe corrosion; Pipe, galvanized; Pipe, lead

Solder; corrosion, impurities and, 2027

Solids; health and, 1146 quality classification on basis of, 1146

permissible content of, 2016 Solids, determination; conductance and, 1653

Somerville, N. J.; filtration, early, 1434

South Pasadena, Cal.; elevated tank,

South Staffordshire Waterworks Co., England; pumping station, automatic control, 2026

Southeastern Section; Journal, 7th

meeting, 444 Southern Pacific Railroad; low water explosions, prevention, drop plugs and, 961

Sparrows Point, Md.; diarrhea outbreak, 1668 iron removal, 1668

Spartanburg, S. C.; new elevated tank, 962

Spaulding Dam; see Springfield, Ill. Spectroscopic analysis; see Alkali; Cesium; Potassium; Rubidium; Water analysis; etc.

Spillway; see Dam Spirogyra borgeana; reproduction, carbon dioxide and, 1824

Springfield, Ill.; Spaulding Dam, dedication, 556

Springfield, Mass.; filter operation,

Springfield, Mo.; sewerage improvements, 970

Springs; copper sulfate treatment, 951

radioactivity and, 662 rare elements and, 662 selenium and, 1159 water supply and, 282, 288, 432 see Water, ground

Sprinkler system; service charge and,

Standpipe; concrete; architecture, 274

pre-stressed, and cost, 273 waterproofing, 273 iron, guniting of, 155 see Storage; Tank

Starch; -iodine test, sensitivity, 821 waste, composition and uses, 971 Stark; see Bacterium coli test

Steam plant; advances, recent, 555 see Boiler; Heating system

Steel; corrosion; 1160 carbon dioxide and oxygen and,

inhibitors, organic, and, 1161 in sea water, copper addition

and, 1143 metallurgy, historical review, 558 painting, preparation for, 556

protective films, permeability, determining, 670 see Boiler; Pipe, steel

Sterilization; see Chlorination; Lime: Permanganate; Ozone; Silver; Swimming pool; Ultra-violet Storage; bacterial reduction and, 828 elevated; 1142

advantages, 1436 fire insurance rates and, 274 trend in, 2011

see Reservoir; Standpipe; Tank Strain meter; elastic wire, improvements, 290

Stream; flow, determination from rainfall records, 437 gaging, automatic radio trans-

S

T

mitters and, 1831 sediment in suspension and, rela-

tionship, 1437 see Books; Pollution; Runoff Sugar; waste, composition and uses,

Sugar, beet; see Odor Sulfate; permissible concentration, 2016

Sulfate determination; 821 colorimetric, 1150 nephelometric, 427 photoelectric, 1825 step-photometric, 1146 turbidimetric, 814 volumetric; 1150, 1444, 1446 in boiler water, 1817, 2028 palmitate and, 825

Sulfite waste treatment; 2029

biological, 2027, 2029 see Taste and odor Sulfur dioxide, liquid; water content,

determination, 812 see Cylinders Sulfuric acid treatment; see Hydro-

gen-ion concentration Sunfish; oxygen deficiency and, 820 Sunlight; see Oxygen dissolved Surface tension determination; measure of contamination, 1818,

Suspended matter; see Sediment; Sedimentation; Turbidity

Swimming pool; chemical feed, 551 chlorination; bleaching powder and copper sulfate, 1144 residual, bacterial counts and,

taste and odor, chloramine and hypochlorous acid and, 2014 coagulation, alum and, 1144 filtration and, 551, 2014

inlet and outlet arrangement, 551 microörganisms, chlorine, copper and silver and, 2015

sanitary control, 958

water; chemical tests, value, 1158 Cumasina electrolytic disinfec-tion with silver or insoluble anodes, 2016 Katadyn, electro-, treatment, 1144 nitrite, albuminoid ammonia and oxygen absorbed, significance, quality standard, 1656, 2015 waterproofing, tar products and, 558 Synedra; chloramine and, 2034

taste and, 2034 Tabellaria; copper sulfate and, 292 Tacoma, Wash.; concrete and steel pipe bids, 275

experience with, 565

steel pipe in exposed locations, 2023 Tank; elevated; architecture, 2010 cost, 962

earthquake and, model studies, 553

new, 152, 962, 970, 1443, 1663, 2010 radial-cone bottom, 273, 1441 steel, new, 279

water level, remote control, 1443 hydropneumatic, underground, and cost, 1660

paint, taste and odor tests, 1830 wash water, concrete, underground, 146

wood, 1161

e Pressure; Pump Standpipe; Storage Pumping station;

Tannery waste; utilization, 971 Tanning; water treatment for, 814 Tar; road, phenols in, fish and, 429 Taste and odor; aeration and, 1438 bibliography, 1434 bleaching clay and, 1434

brines and, bromide and, 834 carbon and; 291, 828, 833, 1813, 2011 extent employed, 1434 filtration, 426, 435, 445

history, 1434

powdered, addition; 157, 434, 1438

application, point of, 150, 289, 426, 678, 1163 dosage, 150, 289, 426, 827, 2033

causes, 291, 832 Chara and, 1813

chlorination and; ammonia and, 150, 289, 291, 828

pre-, 289, 291

super-, 422, 1164 control, 159, 283, 433, 834, 969, 970, 1142, 2017

copper and, 427 filtration, rapid sand, wasting after washing and, 2033 measurement, 2017 microörganisms and; 828, 969

carbon and; 833 dosage, 2034, 2035 point of application, 2034 chlorination; ammonia and, 833 super-, and dechlorination, 833

copper sulfate and, 291, 292 lime and, 2035 permanganate and, 833

prevention, 2016 ozone and, 433, 1434, 1439 paint tests, 1830

permanganate and, 291, 1434 phenol, permanganate and, 291 sodium aluminate and, 291 softening, permutite, and, 1825

sulfite waste, chlorination and; ammonia and, 291 super- and dechlorination and,

291

zinc and, 430 see Chlorination, taste and odor; Odor

Taylorsville Dam; shrinkage and, 425 Tees River; coke-oven waste pollution, 1817

Teeth, mottled enamel, fluorine and; 547, 1657, 1820, 1822 concentration and, 151, 282, 824,

968, 969, 1813 see Fluorine

Tegul; see Pipe joint

Temperature; see Coagulation; Color removal; Microscopic organisms Tennessee River Basin; mapping, 147 Tennessee Valley Authority; Norris Dam, drill bit tests, 2023

Texas; P. W. A. projects, status, 967 sewage irrigation, 970 State Board of Water Engineers,

activities, 969

State Reclamation Dept., activities, 969

stream pollution, 969 tooth enamel, mottled, 151, 968 water; conservation and, 967

ground, resources, and bibliography, 2017 legislation and, 969 quality standard, 2016

rates, analysis, 968 and, Relief supplies; drought Commission activities and, 970 safeguarding, State Dept. recommendations, 829 works; short school, 17th, 967 status, 968

Textile waste; composition and uses, 971

pollution and, 1829

treatment and cost, 1829

Thiobacillus thioöxidans; pH and, 425 Thiosulfate; see Sodium thiosulfate Tientsin, China; water department report—1934, 444

Titration indicator; 4-nitrocatechol, 1446

Toledo, O.; cross connections, control, 2033

water works funds, diversion, 284 o-Tolidin; see Chlorine, free, determination

Tolkewitz; color and manganese removal, 1656
Toronto, Ont.; dechlorination build-

ing, new, 144

Victoria Park; filter plant, features, 422

pumping station; 287

construction, ground water lowering and, 2023

Treatment; 559, 967, 2030 chemical control tests, 967 developments, 159, 1142

plant, experimental, laboratory-scale, 1822 trends, 1830

see Purification

Trenton, N. J.; alum containing carbon, use of, 434

Triphenylmethane; see Dye

Trout; ammonia still waste and, 1817 cyanide and, 660, 1817

Tucson, Ariz.; water works operation and costs, metering, rates, 150, 560 Tunnel; connections to, procedure,

construction; 274, 553

costs, unit, 144 mucking, belt conveyors and, 274 in rock, air-slaking, guniting and, 553

rock projections, removing, machine for, 1433 in shale, disintegration, asphalt

coating and, 274 water inflows and, 553 lining, concrete; 274

costs, unit, 144 Turbidity; see Coagulation; Sediment; Sedimentation

Turbidity determination, photoelectric; 963, 966 signal and, 289, 1813

Turbine, steam; see Pumping station

Typhoid; carriers and, 1436, 1668 Connecticut and, 1155

epidemics; Olean, N. Y., 833 recent, 833

water-borne; 151, 830, 1823 gastro-enteritis astro-enteritis preceding, protection and?, 1832

well and, 2033 Germany and, 1143 London, England, and, 443 Maryland and, 1668 Massachusetts and, 952, 1156

Michigan and, 835 New York State and, 830 Pennsylvania and, 833, 1154

season and, 833 shellfish and, 833

stream, polluted, and, 150 trends, 833

in United States and other countries, comparison, 833

water; -borne; damages, court de-cisions and, 955, 956

responsibility and, 833 supply and; 833

purification and, 674, 835, 1154, 1155, 1156

see Bacterium typhosum; Disease

Ultra-violet ray treatment; 434, 1824,

Uniontown, Ky.; purification and pumping plant, 1665

United States Bureau of Reclamation; All-American Canal; desilting works, 2020

progress, 145 Boulder Dam; cements, heat of hydration, 1149

closure, revised plan, 147 heat prostration, salt in drinking water and, 1666

rock grouting, 275 spillway, model tests, 286 status, 2022

storage begun, 147 Owyhee tunnels, lining and driving,

Pine View Dam, Ogden supply and,

investigation, 2018 United States Navy; boiler compound, 811

United States Public Health Service; interstate carrier supply certification in 1933, 444

Upper Potomac River Commission; 1668

Utah; ground water rights, 277 well drilling regulations, 552 Utica, N. Y.; softening plant, 1813 Utility, public; discrimination, ruling re, 159

Vallejo, Cal.; water rights case, 144 Valuation; Supreme Court decisions, 1832

Valve; improvements, 834

materials and, 1814 see Cross connections; Distribution

system; Pump Vancouver, B. C.; see Greater Van-couver Water District

Venezuela; amebiasis and, 1441 Venturi meter; flow nozzle and orifice, relative merits, 964 see Pipe flow

Vernon, Cal.; Diesel-driven electric station, 555

Vessel, navigating, water supplies; chlorination and dechlorination with carbon, 445

contamination, sources, 1824 filters and, 445

gastro-enteritis and, 445 Javelle water treatment, 1823

ozone treatment, 1824 ment, 1823 para-typhoid B and, 445 potassium

ultra-violet ray treatment, 1824 Voges-Proskauer test; special rea-

gents and, 1819 Volvox; chlorine and, 1828 Vom Wasser; IX, 1935, 971 X, 1935, 2028

Waco, Tex.; water department, administration, 279
Walton, N. Y.; flood and, 677
Warwick, R. I.; distribution system

extensions, 677 Washington Suburban Sanitary Dis-

trict; Burnt Mills filter plant, 1142,

Water analysis; early practice, 1434 equipment, 828

mineral; conductivity and, 1652 expression of results, graphical, 1652

spectroscopic, 548, 662 verification by summation and by electrical resistivity, 547

nitro effect and, 548

records, importance, 1436 Standard Methods, 8th edition, recommended changes, 1436

see Bacteriological examination; Books; Chlorine, free; Metal; Odor; Phosphate; Precipitate; Silica; Treatment; Turbidity; Water, bottled; regulations, Santa

Barbara, Cal., 831 Water closet; flush valves, backsiphonage, vacuum breakers and, 1155

see Plumbing

Water company; mutual, operation, obligation to serve all public, 1661 rates, law and, 1663

Water cost; Erie, Pa., 1162 Tucson, Ariz., 150, 560

Water, gratuitous; discrimination and, 676 Erie, Pa., 1162

Water, ground; composition, logical environment and, 662 geoflow, tracing, 970 geology and, 278

inventory, continuing, importance,

iron and manganese and, 559 laws relating to, 1437 level; decrease and, 827, 1145

lowering for construction, Moretrench system, 2023 restoration, in Wisconsin, 2012

metal corrosion, hydrogen sulfide and, 1142

pollution; cess pools and, 832 copper sulfate from wood impregnation plant, 1149 subterranean streams, court decisions and, 960

reservoirs; capacity, evaluation, 2019

silting, 2017 rights; 562

Utah decision and, 277

Texas and, 2017

use, increase, air conditioning and, 2038

see Infiltration gallery; Spring; Well

Water measurement; see Level; Nozzle; Orifice; Pipe, flow; Venturi; Weir

Water, mineral; analysis, spectroscopic, 548, 662

heavy metals, determination, 1159 sampling and verification of analysis, 547

silica in, form of, 550 Water quality; aluminum, limit and,

678 B. aerogenes, significance, 949, 1821 chloride, limit and, 2016 colon-aerogenes group, icance, 833

copper, limit and, 1144, 1147

interstate carrier supply certification in 1933, 444 iron, limit and, 678 lead, limit and, 551 vs. quantity, 1163 responsibility and, court decisions, 151, 159 selenium and, 1159 silver, limit and, 1144 solids, total; classification on basis of, 1146 limit and, 2016 standards; changes in, 1434 status, 1437 sulfate, limit and, 2016 for various purposes, 662 zine, limit and, 430 see Pollution; Teeth; Swimming pool; Water analysis Water resources; governmental agencies, activities of, 1437 national studies needed, 147 planning, national, 1142 state planning board studies, 1433 Water rights; appropriation and, 281 riparian; vs. eminent domain, 562 laws, 954 vs. reasonable use, California court decision, 143 see Books; Water, ground Water supply; cooling, copper coil in well and, 281 developments and progress, 154, 1142, 1433, 1435 drinking, in factories, survey, 829 drought and, 970, 1154 governmental function and, 960, industrial system, new, Birmingham, Ala., 1443 institutions, code and, 957 lakes, chain of, and, 562 plans for, 565 roadside, licensing, 292 service, court decision re, 561 source; data, 1440 ground vs. surface, 951 selection, 952 supervision, state, 444 surface, scoring, 158 see Army; Books; Fire protection; Purification; Treatment; Ty-phoid; Water, ground; Water Purification; Treatment, phoid; Water, ground; quality; Water works; etc. Water, unaccounted for; London, Ont., 288

reduction, leakage

Lancaster, N. Y., 279

Water works; beautification, 674, 1142

construction in frozen ground, 953

survey and,

cost, fire protection and, 675 damage to private property, liability and, 954 employees; "career service" and, compensation for disability, law and, 952 dismissal, law and, 952 income tax and, 1664 licensing; 966, 1142, 1664, 1815, 2033 committee report, 560 progress, 424, 2033 schools; 440, 441, 560, 565, 966, 1142 progress, 424 seniority, law and, 952 training, 970 flood and, 1156, 1814 improvements, weighing against possible gains, 290 as investment, 155 landscaping and, 1666 lighting system, emergency, 954 materials and equipment, progress, 291 ownership; data, 1439, 2010 trend, 825 photographs of, 280 service outside city limits, law and. 952 small, efficiency, increasing, 673, 1164 village, planning and constructing, 2011 see Administration; Billing; Books; Distribution system; Emergency; Fire protection; Injunction; Injury; Purchasing; Utility; Water company; Water supply; etc. Waterford, N. Y.; taste and odor, 291 Waterproofing; tar products and, 558 Watershed; control, zoning and, 1439 fire protection and, 1662 reforestation, 1662 sanitary control, 969 Waukesha, Wis.; standpipe, new; 273 fire insurance rates and, 274 well supply improvements, 561 aupun, Wis.; softening; and iron Waupun, removal plant, 955 soap saving and, 955 Weather; changes, theory, 281 Webbolite; see Softening Weir; rounded crest, flow over, formula, 276 sharp-crested, suppressed, charge formulae and tables, 437 Welding; acetylene, advances in, 143 see Books; Pipe, steel

Well; artesian, under water in reservoir, 2018 capacity; determination, 965 increasing, shooting and, 970 screen area and, 440 cleaning, dry ice and, 966 construction; 951 control, state, 971 drilling, state regulation, 552, sanitary requirements, 159 deep, cost and history, 1664 drought and, 1154 location, 159 manganese and, 148 new; 279, 674 testing, importance, 1432 pollution; causes, 2016 gasoline and, 948 private wells in use for years without harm; condemning and, 2033 immunity and, 2033 regulations re, Kansas, 2016 shallow, protection and, 951 tracing, fluorescein-bromide and, 951 typhoid and, 2033 pumping, automatic, 279, 424 reclaiming, 440 sand filters, 1656 screen, manganese deposit, removing, acid and inhibitor, 560 sterilization, hypochlorite and, 677 supply; 288, 290 cost, 279, 2026 improvement, 561 new; 1660 Layne type, 1661 protecting, private well regulations and, 829 vs. surface, 951 surface water irrigation and, 1144 water; analyses, interpretation,

sanitary survey and, 835 corrosiveness, limestone, addi-

tion to well and, 951

sampling apparatus, 965

see Artesian; Water, ground

West Virginia; Conference on Water

level, indicator, 2023

Purification, 10th, 1163

mine waste; control, 1164 volume, 425 pollution, control, 1164 P. W. A. projects, 1163 springs of, 1164 Western New York Water Co.; meter reading and billing, 1442
Weston, Ont.; well supply, automatic, 424 Wettingen, Switzerland; red water and pipe growth troubles, 2015 Wheeling, W. Va.; billing and collection, 1440 White River; oxygen, sunlight and, 667 Willow Creek Dam; see Aberdeen, S. D. Winnisquam Lake; pollution, 830 Wisconsin; lake and ground water levels, restoration, 2012 plumbing, cross connections and, 830 well drilling, regulations, 552, 2010 see Books Wood distillation waste; phenol content, 1823 Woodstock, Ill.; main cleaning prior to use of softened water, 1439 Woodsville, N. H.; water supply, 832 Worcester, Mass.; service trenches, joint use of, 676

Xylenol; in road tar, and solubility. 429

Yeast; Katadyn and, 441 Youngstown, Ohio; see Valley Sanitary District Mahoning

Zinc; corrosion; in distilled water, rate and effect of temperature, 426 pH and, 678 determination, turbidimetric, 432 paint and, reaction and, 1444 in water; permissible concentra-tion, 430 removal, synthetic resins and, 430 taste and, 430 see Hot water system; Iron, galvanized; Pipe, galvanized; Pipe, zinc; Services Zürich, Świtzerland; slow sand filtra-

tion, results, 2015